NOVICE TEACHER DEVELOPMENT IN A PROJECT-BASED LEARNING SCHOOL

by
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Abstract

Teachers who receive insufficient pre-service training and professional development for presenting project-based learning (PBL) may be at an increased risk of attrition from the field of teaching. The literature review explores the areas of project-based learning teacher preparation and subsequent project-based learning professional development. In order to determine what needs to be included in teacher preparation and teacher professional learning regarding PBL instructional strategies, current literature were used to better understand theories, with constructivist underpinnings and underlying causes of attrition. Further, the literature will define the research questions presented with the purpose of investigating the role both pre-service teacher preparation and in-service teacher professional learning play in teacher attrition. This study seeks to understand how methods of preparation for novice teacher candidates and professional learning for practicing teachers can be attributed as constructs that may lead to teacher attrition or retention, as well as how other various teacher characteristics, including school environmental support and enhanced teacher efficacy can decrease teacher attrition. Exploration of the current professional development practices in PBL and the support needed to decrease teacher attrition will take place in an attempt to understand possible interventions of professional learning and mentoring focused on increasing teacher knowledge and teacher efficacy among teachers working in a project-based learning environment.

Keywords: *Teacher Development, Project-Based Learning, Professional Development*

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The student has made all necessary revisions, and we have read, and approve this dissertation for submission to the Johns Hopkins Sheridan Libraries as partial fulfillment of the requirements for the Doctor of Education degree.

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Dedication

This dissertation work is dedicated to my loving wife Kelsey, without whom, none of this would have been possible. You truly are the best thing. And to my girls – Shelby and Norah, you kept me smiling all the way.

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Executive Summary

Novice teacher development through professional development (Garet, Porter, Desimone, Birman, & Yoon, 2001) and mentoring (Barrerra, Braley, & Slate, 2010; Huling & Resta, 2001) has been found to increase teacher efficacy (McCaughtry, Cothran, Kulinna, Martin, & Faust, 2005; Smith & Ingersoll, 2004) and perceptions of environmental support (Andrews & Quinn, 2005). This mixed methods study investigated how teacher participation in project-based learning (PBL) focused professional development, with embedded mentoring, could influence novice teacher PBL strategy usage, PBL teacher efficacy, and teacher perceptions of school environmental support at a project-based learning school.

Problem of Practice

The study originated with the problem of novice teacher attrition and understanding the reasons that novice teachers were leaving field of education, which has an impact on school performance and student achievement (Boyd, Grossman, Lankford, Loeb, & Wyckoff, 2006). As the study developed, the variables of teacher preparation for instruction (Darling-Hammond, 2003; Ingersoll, Merrill, & May, 2014), teacher efficacy (Hebert & Worthy, 2001; Yost, 2006), and perceptions of environmental support (Hebert & Worthy, 2001, Johnson & Birkland, 2003) became the focus with the goal of impacting the distal outcome of teacher retention. Professional development that is embedded in a teacher's practice and mentoring have been found to positively impact teacher efficacy and perceptions of environmental support (Garet, Porter, Desimone, Birman, & Yoon, 2001; Hughes, 2012; Huling & Resta, 2001; Ingersoll & Smith 2004). The intervention designed delivered PBL focused professional development that would have a positive influence on PBL strategy usage, teacher efficacy and perceptions of environmental support.

Context

The context for the dissertation study was a project-based learning school in the Abraham school district (all names are pseudonyms) located in a rural town in the southern United States. The school, which operates within the context of a larger school, serves approximately 300 students in ninth through twelfth grades. The project-based learning program covers all core content areas including mathematics, English –language arts, science, social studies as well as electives courses in various subject areas. The faculty of the school consists of 55 individuals ranging in PBL experience from zero experience to five or more years of PBL classroom experience.

Theoretical Framework

This study is guided by the theory of constructivism, which provides insight in the generation of knowledge and meaning through the interactions of an individual's experiences and learned knowledge. (Ertmer & Newby, 1993). This process of acquiring new knowledge and the experience of the learning (Jonnasen, Mayes, & McAleese, 1993) is the foundation of project-based learning. When employed in changing the attitudes of teachers, constructivism can be a useful method (von Glasersfeld, 2005), further, when a constructivist environment that allows leaners to drive their own learning through inquiry, collaborate with their peers, and create content that reflects their knowledge learner comprehension and learner achievement can be impacted positively (Bell, 2010).

Research Purpose and Objective

The purpose of this study was to determine the influence PBL focused professional development and mentoring could have on novice teachers. The areas of focus included teacher efficacy concerning PBL practice as well as the teachers' perceptions of environmental support. The following research questions guided the dissertation study:

1. What components of the professional development course influenced PBL strategy usage in the classroom?
2. What components of the professional development course influenced PBL teacher efficacy?
3. What components of the mentoring sessions, as a part of the PD influence a teacher's perceptions of school environmental support?

The following evaluation research questions evaluated professional development program administration:

1. Was the professional development delivered as scheduled?
2. Did the participants attend the professional development as intended in the design?
3. Were there any changes in the delivery of the professional development?

Research Design

A mixed methods design was used to collect and analyze quantitative and qualitative data that informed the research questions (Creswell & Plano Clark, 2011). The intervention was a series of professional development workshops with embedded mentoring for novice teachers. The quantitative data collected included pre- and post surveys on teacher efficacy, perceptions of environmental support, and mentoring. Quantitative data was also collected through teacher observations. The qualitative data collected was achieved through classroom observations of teachers, post-professional development surveys, and researcher field notes.

Intervention

The intervention consisted of teachers (N=55) participating in a six-session professional development course focused on project based learning practice. The content of the sessions included: focus on constructivist theory, student engagement, student

achievement, scope and sequence, development of driving questions, project development, student assessment, discourse management, curriculum management, classroom management, literacy design in projects, and project evaluation. In the final session of the professional development, teachers were given the opportunity to view the projects designs of other teachers and give feedback as well as receive feedback on their own work. Throughout the course, experienced PBL teachers with novice teachers held one-on-one mentoring sessions. Each session was three hours in length and sessions were held approximately once per month. The intervention began in the fall of 2018 and concluded in the spring of 2019.

Data and Data Analysis

The quantitative data collected included pre- and post intervention surveys of: teacher efficacy, organizational health, classroom observations, and mentoring. Descriptive statistics and paired sample *t* tests were used to analyze the findings. For qualitative data, surveys collected post PD sessions, researcher notes, and observations from classroom visits were coded in order to determine themes among the data.

Findings

The findings from the study indicated that professional development, which involves mentoring, focused on the practices of project-based learning might positively impact the efficacy of PBL teachers as well as their perceptions of environmental support. While it is unclear whether the distal outcome of retention may be impacted by the PBL focused PD, it is clear that the day to day activities, such as curriculum management and classroom management, of a PBL teacher can be impacted. Several limitations of the study were found. First, there was a lack of a control group. The Abraham school district mandated all teachers in the PBL program participate in the PD, which creates no non-treatment group for

comparison and could possibly skew the participants' attitudes towards participation. Second, the focused PBL setting was a limitation. As, the environment of a PBL school is not overly common; the findings may not be easily generalized into other contexts. Finally, the period of time between the deliveries of the sessions was a limitation. The initial design was to deliver the sessions on a bi-weekly basis, however, the delivery occurred monthly. This gap in time could cause participant exhaustion and a lack of engagement in the professional development sessions. Recommendations include: PBL focused professional development for PBL teachers which allows teachers to learn new skills, refresh on skills previously learned, and develop new method PBL implementation. Also, mentoring for novice PBL teachers is recommended in order to provide novice teachers the opportunities to ask questions, ideate projects, and refine PBL strategy implementation.

Chapter 1

Understanding Teacher Attrition in Project Based Learning

The focus of this study is to determine the role, if any, that professional development and mentoring can play in decreasing teacher attrition in a project-based learning setting. The research conducted takes place in a project based learning (PBL) setting that incorporates technology-based PBL instruction in a diverse high school in the southern region of the U.S. For the duration of this study, this high school is referred to as NTR. This research will investigate different instructional methods used and depth of PBL preparation of teacher candidates and the role that various methods or a need for greater understanding of PBL models may play in teacher attrition or retention in PBL based schools. Also, this investigation will explore the professional context by assessing professional learning needs of teachers in a PBL environment. This study seeks to understand how PBL focused professional development for practicing teachers can be attributed as a characteristic that may lead to teacher retention, as well as understanding how other teacher characteristics, including teacher efficacy and the teachers' perceptions of the school environmental support may play a role in attrition. Moreover, the study seeks to understand other possible factors associated with teacher attrition from the infrastructure of the PBL setting.

Problem of Practice

The problem of practice (POP) focuses on teacher attrition within the context of the PBL school environment. Attention to the background of this problem will seek to identify what variables in classroom practice related to PBL lead to teacher attrition. Emphasis in the study is placed on teachers who are involved in project-based learning, specifically their route into the field of education and preparation for a PBL approach to student learning. A specific focus for this study included the examination of novice teacher attrition from the

PBL environment. For the purposes of this study, novice teachers are defined as individuals who are serving in their first five years of professional practice. The teachers' involvements in professional development, involvement in a school culture of support and mentorship, and level of teacher efficacy toward using PBL strategies were explored to gain a better understanding of why teachers are leaving the PBL setting at a higher rate than teachers working in schools using more traditional instructional modalities.

Theoretical Framework

The constructivist perspective of learning provides an insight into how human beings generate knowledge and meaning from interactions between experiences and the learned knowledge. Through constructivism humans create meaning as opposed to acquiring it through their experiences (Ertmer & Newby, 1993). Learners seek to interact with the environment, think for themselves and apply their prior knowledge to new learning contexts. The focus of constructivism is to describe how learning happens or how the learner experiences the process of learning (Jonnassen, Mayes, & McAleese, 1993). The constructivist model focuses on the uniqueness of the learner and how specific learners generate knowledge. The learner is encouraged through the perspective of personalizing knowledge and adding to existing knowledge as a part of the learning process. The constructivist perspective addresses each student's individual needs by allowing learners autonomy to place a focus on the unique learning characteristics that contribute to their learning style or are aligned with the nature of the learner (Wang, 2014). Wang contends that the nature of the learner, in this case the teacher, or the learner's personality plays a significant role in the behaviors and actions of students in the classroom. von Glasersfeld (1989) further supports this idea by asserting that the nature of the learner and the responsibility for learning must be considered as factors that impact classroom performance. The constructivist approach to learning focuses on the individual student and allows him/her

to be a responsible, active agent in his/her knowledge acquisition process (Loyens & Gijbels, 2008). Constructivism is founded on the fundamental assumption about learning that knowledge acquired by the learner is actively constructed through the process of adding information to knowledge previously acquired (Birenbaum 2003; Harris and Alexander 1998; Tynjälä, 1999).

Constructivism within an educational context argues that the learner should be the central focus (Noddings, 1990). Moreover, Piaget (1967) asserts "…all knowledge is tied to action, and knowing an object or event is to use it by assimilating it into an action scheme…" (Piaget, 1967, pp. 14-15). Piaget contends that knowledge construction takes place when the learner's new knowledge is actively assimilated or accommodated into existing knowledge. Piaget's assertions align with Von Glasersfeld's (1989) in that learners do not mirror and reflect what they read; rather they explore meaning and try to organize their learning into their current framework of the world around them. Further, this approach suggests that the perspective of the learner is in constant revision and re-construction as new knowledge is gained and new experiences take place. As the constructivist model differs from more traditional models of learning, it is necessary to address the attitudes of teachers toward constructivist instructional practices in order to ensure effective.

Constructivism is useful as a method for understanding and changing the attitudes of teachers (Von Glasersfeld, 1989). In the constructivist approach, knowledge gathering is defined as a collection of actions and beliefs that have been effective in the school setting (Von Glasersfeld, 1989). As teachers continue the learning process, assimilation occurs merging the current learning actions and beliefs with preceding actions and previously held beliefs. Through this process, teachers construct meaning by interaction with the setting and integrating new experiences with previous interactions (Clark & Caffarella, 1999). In this way, teachers with student-centered instructional approaches regularly provide students with

opportunities for exploring new concepts in their own way. By using the constructivist perspective, a teacher can implement strategies in a manner that provides students with the opportunity to actively construct their knowledge (Von Glasersfeld, 1989). Actively constructing knowledge is one of the primary principals of the Project-based learning model. In this style of classroom instruction, students are given a focused task and build upon the knowledge that they have in the given subject area.

Project-Based Learning

Project-based learning (PBL) is a modality of curriculum instruction in which students work collaboratively in groups to solve rigorous problems that are authentic and curriculum-based (Bell, 2010; Grant, 2002; Soloman, 2003; Thomas, 2000). According to the definitions found in PBL handbooks for teachers, these projects are complex tasks, based on challenging questions or problems, that involve students in design, problem-solving, decision making, or investigative activities; give students the opportunity to work relatively autonomously over extended periods of time; and culminate in realistic products or presentations (Jones, Rasmussen, & Moffitt, 1997; Thomas, Mergendoller, & Michaelson, 1999). Students gather, synthesize, analyze, and derive knowledge from content and direct the learning that takes place. During the culmination of the project, students demonstrate their acquired knowledge and are assessed on content they have learned and their clarity in communicating what has been learned. Through deep engagement in the content of a problem or project, learners decide how to approach the problem and the avenues and activities that will support interventions or solutions to the problem. By definition, in a PBL unit, a final product is required at the culmination of each project. Through creativity, learned knowledge, and research, students generate the final product. Blumenfeld, Soloway, Marx, Krajcik, Guzdial, & Palincsar (1991) assert that two essential features lead to the

creation of this final product: the driving question and the corresponding scaffolded activities (Blumenfeld et al., 1991).

The driving question is a central component to the PBL model that serves to direct student inquiry and research design. Blumenfeld et al. (1991) further contend, that this question cannot be constrained in such a way that it limits the creative process of learners as they construct their own knowledge. The question, posed to student at the beginning of the PBL unit must make a project intriguing to the learner and address authentic and relevant concerns, it must be complex in its requirements, and it must be problematic in that it gives student multiple avenues to respond. Larmer, Ross & Mergendoller, (2009) suggest that the driving question should require multiple activities and the synthesis of different types of information before it can be answered. The development of the final project and the work that learners participate in should continually be focused on the driving question.

As the driving question is the focus of the construction of knowledge, the communication of the final product is the representation of that knowledge. The final product of a PBL project is generally seen as a task that requires in-depth understanding of content and the application of complex skills. As a summative assessment, the final product of a project should be an authentic tangible representation of student knowledge that is aligned with instructional outcomes (Larmer et al., 2009). Through the development of a project, the final product can take on many various forms whether written products, presentations, technological products, modeling, or procedural products. As students work to answer or resolve the driving question, the outcome should be the final product.

PBL projects must meet several criteria in order to be an exemplary experience aligned with best practices. The content of the project must be significant in nature and must be derived from the standards and key concepts of the subject matter (Thomas, 2000). Further, the PBL project must engage students in an extended, rigorous process of inquiry. If

students are expected to construct their own knowledge, they must be provided with opportunities to ask questions, use resources, and develop their own ideas. This modality of PBL learning emphasizes the tenets of Von Glasersfeld (1989) in that students are actively engaged in knowledge construction that allows them to solve authentic issues that face individuals on a daily basis. Finally, students must be working to build 21st century competencies (Bell, 2010). In building a skill set that is valuable for today's world, students must be able to problem solve, think critically, collaborate, communicate, and strive towards innovation (Thomas, 2000). In meeting all of these criteria, the instructor must create dynamic opportunities for learning, which include activities that structure and support learning, guides for inquiry, cycles for feedback, and opportunities for evaluation of the final product (Blumenfeld et al., 1991).

Constructivism and Project-Based Learning

The constructivist perspective places a focus on the dynamic interaction between task, teacher, and learner, a practice that directly relates to the PBL approach. Project based learning, through a constructivist lens creates motivation that many other instructional theories lack (English & Kitsantas, 2013). Learners are engaged in the construction of their knowledge in a self-directed manner and as a problem or project is introduced, an interaction begins between student, teacher and the task. As evidenced by research, PBL can be effective when implemented with rigor and fidelity (Alacapinar, 2008; Bell, 2010; Blumenfeld et al., 1991; Kaldi, Filippatou, & Govaris, 2011; Major & Palmer, 2001). High quality PBL experiences allow students to drive their own learning through inquiry, as well as work collaboratively to research and create projects that reflect their knowledge and develop 21st century skills (Bell, 2010). When this type of PBL environment exists both learner comprehension and learner achievement can be impacted positively (Bell, 2010). However, the learner is not only involved in knowledge construction process, Holt and Williard-Holt

(2000) assert that the teacher and the learner are equally involved in learning from each other. This dynamic relationship suggests that the culture and worldview of the teacher also plays a role in shaping the learning as it takes place.

The Role of the PBL Teacher

By using the constructivist perspective a teacher can implement strategies in a manner that provides students with the opportunity to actively construct their knowledge (Von Glasersfeld, 1989). The project based learning environment requires a teacher to understand how differently they must view the classroom from a more traditional lecture based style of teaching. As stated by Von Glasersfeld (1989) the constructivist perspective encourages the focus of learning to be on the student and their interaction with the learning. This can mean significant changes in the role of the teacher and the dissemination of information to students. In this perspective of learning the teacher or instructor is no longer viewed as the primary source of information but rather as a teacher of multiple sources of information. In the role as teacher, the focus is placed on the student as learner rather than on the content knowledge creating a learning environment that is almost entirely self-directed (Ruiz-Gallardo, Castano, Gomez-Alday, & Valdes, 2011). Developing a skill set of constructivist principles is more imperative than ever before, as more schools and districts move towards integrating constructivism into content instruction. This change in practice requires a shift in the preparation and implementation of curriculum instruction in the classroom context. The constructivist view encourages a self–directed environment as students take the lead in their own learning.

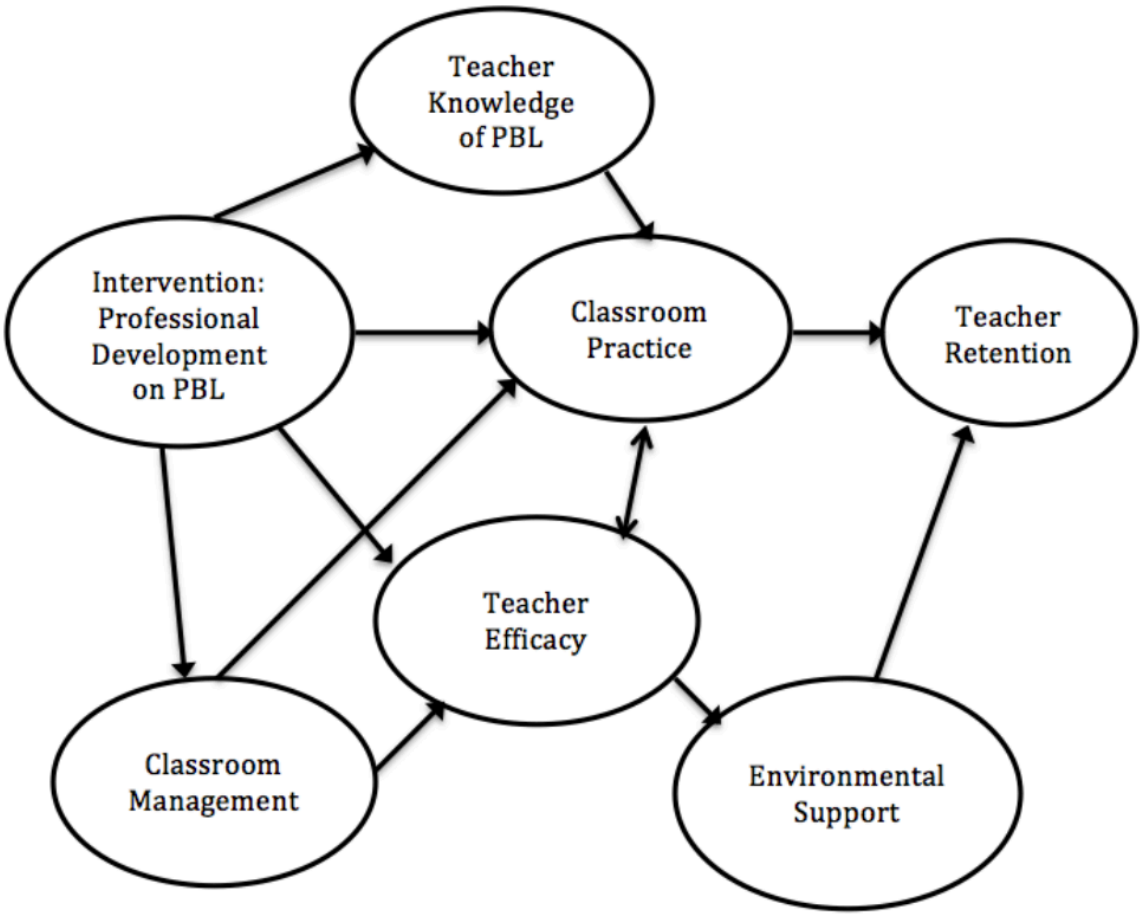
Statement of the Problem

In recent years, compelling evidence has emerged that teacher turnover is a significant problem affecting school performance and student achievement (Boyd,

Grossman, Lankford, Loeb, & Wyckoff, 2006). Research conducted by the National Center on Education Statistics (NCES) and the National Commission on Teaching and America's Future (NCTAF) reported in 2003 that approximately one-third of America's new teachers leave the field at some point during their first three years of teaching, while almost half leave during the first five years (NCTAF, 2003). While this finding from the NCTAF is widely confirmed in the educational community, conflicting research conducted by the U.S. Department of Education's National Center for Educational Statistics emerged in 2015. These data suggest that the widely held perception that new teachers experience a high turnover rate might not be as expansive as previous studies reported. The data collected from the 2007 school year through the 2011 school year suggest that new teacher attrition was not a nationwide trend.

Teacher turnover can have negative impacts in a school environment as it creates instability in the continuity of instruction due to faculty leaving (Boyd et al., 2006). Further, teacher turnover has been shown to be specifically detrimental to students in English and mathematics classes (Ronfeldt, Loeb, & Wyckoff, 2013). In an eight-year study of more than 600,000 fourth and fifth grade students from New York City, researchers found that higher turnover of teachers is correlated with lower test scores (Ronfeldt, et al., 2013). As the literature suggests, students can be negatively impacted by teacher attrition; however, in order to fully understand the problem of teacher attrition exploration of the underlying causes of attrition must be examined.

Figure 1.1 *Teacher Attrition Conceptual Framework*



There are several factors that play a significant role in the development of teacher knowledge of classroom instructional practices including professional development, teachers' knowledge of PBL and teacher efficacy (Becker & Riel, 1999; Darling-Hammond, 2003; Yost, 2006). As teachers participate in professional development focused on developing knowledge of pedagogical instruction and developing new skills for increasing student engagement, classroom practice can be positively impacted, which also plays a role in a teacher's efficacy (Yost, 2006). The more knowledge that teachers' have concerning their curriculum instruction practices, the more effective that they feel concerning their practice, which ultimately is seen as a characteristic leading towards teacher retention (Buchanan, Aubusson, Burke, Louviere, Prescott, & Schuck 2013). The research indicates

that when teachers participate in professional development, they develop positive abilities concerning classroom practice, which can also be found to have correlation with retention (Buchanan et al., 2013; Ewing & Smith, 2003; Fetherstone & Lummis, 2012). While little research has been done to specifically explore these factors related to the project based learning (PBL) environment and how being in an environment focused on PBL may play a role in increasing teacher attrition, research findings can be generalized in multiple educational environments (Loeb, Darling-Hammond, & Luczak, 2005). Another factor related to this issue includes pre-service teacher preparation in PBL practices (Lankford, Loeb, & Wyckoff, 2002).

Teacher Preparation

Teacher preparation programs exist to equip prospective teachers with foundational knowledge about pedagogy and subject matter as well as the skills necessary to manage a classroom environment. Although teacher competence in classroom practice is shaped significantly by on-the-job experiences, teacher preparation programs are important contributors to their practice (Feuer, Floden, Chudowsky, & Ahn, 2013). When teachers do not feel adequately prepared for curriculum instruction, through teacher preparation programs, they are more likely to leave the field (Darling-Hammond, 2003). Teacher preparation, specifically the amount of pedagogical preparation, has been found to have a correlation with a teacher's likelihood of leaving the field of education within the first year of teaching (Ingersoll, Merrill, & May, 2014). In the study, Ingersoll et al., (2014) examined the National Center for Education Statistics' nationally representative 2003-04 Schools and Staffing Survey and its supplement, the 2004-05 Teacher Follow-up Survey in order to understand the types of pre-service education that teachers receive and whether or not there is an association between pre-service education and teacher attrition. The sample of 2,651 teachers represented all grade levels as well as public, private, and charter schools. Ingersoll

et al., found that there was a connection among the teachers who were likely to leave a teaching position and the amount of pedagogical instruction received during teacher training. When a teacher is provided with more pedagogical instruction including credit hours and hours spent in the field, they are less likely to leave the field after their first year of teaching (Ingersoll et al., 2014). However, attrition factors are not only limited to pedagogical instruction, other aspects of the teaching profession also play a role.

While teacher preparation programs attempt to prepare teachers for any issues they may encounter, in practice factors that correlate with teacher attrition often are not covered in coursework but rather depend on classroom experience. Also, working conditions such as large class size, heavy teaching loads, lack of administrative support, and inadequate resources also are factors in teachers' classroom effectiveness (Darling-Hammond, 2003). Teacher preparation for classroom management can also play a significant role in a teacher's willingness to stay in the field of education (Darling-Hammond, 2003). Classroom management is defined as a teacher's ability to monitor student progress and manager student behavior (Stronge, Hindman, Tucker, & Ward 2007; Stronge, Ward, & Grant 2011). In multiple studies, research indicates that a significant gap exists in first year teachers between knowing what classroom management consists of and the ability to implement strategies to manage students in the classroom (Lavay, Henderson, French, & Guthrie, 2012; Oliver and Reschly, 2010).

Classroom Management

Appropriate training on the part of teacher preparation programs in the area of classroom management is necessary to mitigate teacher attrition (Dicke, Elling, Schmeck, & Leutner, 2015). Fifty-six teachers from kindergarten through high school participated in classroom management training and stress management training. Prior to the training, teachers completed pre-intervention questionnaires assessing cognitive-behavioral variables.

Post intervention questionnaires were collected 12-14 weeks after the session as well as 10-12 months post participation. In this study, Dicke et al., (2015) found that when teachers participate in specific training in the area of classroom management they are more likely to feel positively about their classroom practice and are more likely to continue teaching.

Though the goal of most teacher preparation programs is to adequately prepare teachers for pedagogical instruction and classroom management, not all teachers leave their program fully equipped for practice. Thus, it is necessary to continue exploring the ways that teachers increase their knowledge through on the job training.

Teacher Efficacy

A low level of teacher efficacy, or the confidence that teachers have in their ability to promote student learning, is an influential characteristic in teachers' desire to leave the field of education (Yost, 2006). Bandura (1982) asserts that efficacy is directly related to the amount of confidence individuals have in their ability to complete tasks successfully. As teacher preparation programs place a greater emphasis on building effective practice and higher levels of confidence through successful field experiences teachers are more likely to report higher levels of self-efficacy (Hebert & Worthy, 2001). Further, research indicates that professional development that focuses on improving the practice of curriculum instruction can have a positive impact on teacher efficacy (Dixon, Yssel, McConnel, & Hardin, 2014). In the study of 45 elementary, middle, and high school teachers, Dixon et al., (2014) found that increased numbers of professional development hours were positively correlated with teacher efficacy. This assertion suggests that when teachers have opportunities to participate in professional development they are more likely to feel positively about their own abilities in the classroom. Research indicates that teachers who are actively attempting to incorporate PBL into their curricula frequently report low levels of efficacy and perceptions of feeling underprepared for facilitating student-directed learning (Blumenfeld et al., 1991). Decreased

efficacy is considered a characteristic that could lead to teacher attrition, in that, when teachers do not feel positively about their work they are less likely to remain in the field (Skaalvik & Skaalvik, 2016).

Perceptions of Environmental Support

School environment or school culture is also a factor that correlates highly with teacher attrition, specifically, when teachers state that they are not provided with adequate support by administrators and experience a lack of resources (Hebert & Worthy, 2001; Johnson & Birkeland, 2003; Kelley, 2004). Due to the challenge of the teaching profession, an environment of support from administrators and colleagues is an important aspect of teacher retention (Hughes, Matt, & O'Reilly, 2015). Through a survey of 41 elementary and high school teachers, Hughes, et al., explored teachers' experiences of perceived support, areas of received support (professional development), and how they felt this support affects teacher retention. In this study, environmental support was defined as the active role taken by principals and other administrators in assisting, encouraging, and displaying approving attitudes towards teachers. The study found that collaborative environments in which teachers are supported by administrators and colleagues could play a significant role in the decision to stay in or leave their position (Hughes, Matt, & O'Reilly, 2015).

Purpose of the Study

In order to mitigate the negative impact that teacher attrition can have on student learning, the factors that impact attrition must be explored including: method of teacher preparation, a perceived lack of support from the school environment, a lack of effective teacher professional development, and reported low levels of teacher efficacy concerning practice. The purpose of this study is to determine the ways a lack of teacher efficacy, lack of teacher knowledge of PBL, and poor classroom practices of PBL impact teacher attrition.

Further, the study aims to determine what effect, if any, enhancing in-service professional development (including mentoring) may have in increasing teacher efficacy, increasing teacher knowledge of PBL, and environmental perceptions of support while decreasing the characteristics that lead to teacher attrition.

Review of Literature

In order to identify and select relevant articles for this synthesis, searches were conducted in various databases to locate applicable peer-reviewed articles including EBSCOHOST, ERIC, Google Scholar, JSTOR, Education Full Text, and PsychInfo. Articles were limited to seminal texts and publications from the past fifteen years (2005-2018). Databases were explored using the following research terms: *project-based learning, PBL, problem-based learning, constructivism, individualized learning, professional development, professional learning, mentoring, online professional learning, teacher attrition, teacher environment, teacher knowledge, teacher retention, teacher efficacy,* and *teacher preparation.* Reference lists of articles obtained through Internet searches also resulted in the inclusion of some older theoretical articles and studies that are considered classic or seminal references. This literature review draws primarily on peer-reviewed journal articles published between the years 2000 and 2015 as it explores the primary barriers to teacher retention. Further, all literature collected was examined using the rubric for literature review created by Boote and Beile (2005) for its appropriateness in adding significant research to the study.

In a review of the literature on teacher attrition, similar factors emerge in the examination of teacher attrition and teacher retention. Many variables impact teacher attrition within the field of education. This study focuses on teachers' general lack of preparation for various specific pedagogical initiatives, such as PBL. The factors of (1) the method by which teachers are prepared for PBL classroom instruction through higher education and teacher alternative certification pathways (Gardner, 2010; Ingersoll, 2012; Scheopner, 2010;), (2)

level of knowledge of PBL professional learning opportunities which sufficiently prepare in-service teachers for integration of constructivist methodologies (Gardner, 2010; Henry, Bastian, & Fortner, 2011), (3) characteristics of the school culture or environment (Boyd, Grossman, Ing, Lankford, Loeb & Wyckoff, 2011; Gardner, 2010) and (4) teacher efficacy concerning their ability to effectively deliver PBL instruction (Gardner, 2010; Hancock and Scherff, 2010; Viel-Ruma, Houchins, Jolivette, & Benson, 2010) will each be explored.

Teacher Preparation

In recent years, debate has been generated over whether and how teacher pre-service education impacts teachers' practice, effectiveness, and retention in the field (Darling-Hammond, Chung, & Frelow, 2002). The literature presents two routes into the field of education. First, is what is considered to be the traditional route, a four year college or university plan of study focusing on curriculum design, curriculum instruction, classroom management, and access and equity in education (Goldhaber, Liddle, & Theobald, 2013). Second are alternative routes, such as alternative certification pathways through school districts and programs like Teach for America. Some of these programs aim to address teacher shortages by sending graduates from elite colleges and universities, most of whom do not have a background in education, to teach for a two year commitment in low-income rural and urban schools (Helig & Jez, 2010). Research exploring the effectiveness of candidates from traditional teacher education programs versus those from alternative pathways suggests that in the area of preparedness, traditional teacher education program graduates report higher levels of feeling prepared (Darling-Hammond et al. 2002). This study, conducted by the New Visions for Public Schools organization in New York City, surveyed 2,956 teachers with four or fewer years of experience. Among the respondents, 66 percent had obtained their certification through a university-based credentialing program while 34 percent obtained their degree through an alternative route. The survey asked new teachers to rate

their preparedness and their personal views about teaching, including their sense of efficacy and their plans to remain in the teaching profession. Specifically, in the areas of curriculum and teaching strategies and meeting the learning needs of students, this research indicates that traditional teacher education programs are more effective in training teachers than alternative routes (Darling-Hammond, et al., 2002). In recent years, there is renewed focus at both the federal and state level concerning the quality of teacher training, and whether or not educational policy should be created that would create changes in pre-service teacher preparation in order to impact teacher performance (Darling-Hammond & Bransford, 2007).

Research conducted on the route of entry into the teaching profession asserts that teachers who graduated from traditional education programs such as four year B.A. programs, are less likely to leave the field than teachers from emerging modalities, such as alternative certification programs, online teaching certification programs and programs that bring educators in from other fields of expertise, such as Teach for America (Raymond & Fletcher, 2002). The traditional teacher education preparation programs are generally lengthier and have more strenuous requirements than alternative certification programs (Darling-Hammond et al., 2002). Research suggests that educators from programs such as "Teach for America" (TFA) may be at risk for a higher rate of departure from the education profession entirely (Darling-Hammond, Holtzman, & Gatlin, 2005) The research however, neglects to make the distinction between the causality of the TFA teachers' attrition being related to actual classroom performance or their leaving to return to previous career fields (Laczko-Kerr & Berliner, 2002). Frequently research that specifically examines alternative pathways to classroom practice, such as TFA, is based on indexes that measure the ability of a teacher to effectively impact students in a positive way (Glazerman, Mayer, & Decker, 2006).

While research on the effectiveness of teachers with different pre-service experiences has come to differing conclusions about mean differences in effectiveness (Anthony, Kane, Bell, Butler, Davey, Fontaine, Haigh, Lovett, Mansell, & Naidoo, 2008), it appears that the variation within certification routes is much greater than the variation across routes (Anthony et al., 2008; Boyd et al., 2006). Meaning, that a teaching certification from a traditional program may be very different from institution to institution. In the research previously discussed from Ingersol et al., (2014), it was found that the varying degree of background preparation in pedagogical instruction played a significant role in a first year teacher's willingness to continue teaching. Further, the authors contend that the amount of course work focused on teaching is diminished in individuals who obtain degrees in other areas of concentration and then add on a teaching certification (Ingersoll et al., 2014).

Research conducted by Goldhaber and Cowan (2014) examines both the job placement and attrition patterns of teachers through the examination of licensure pathways in different teacher preparation programs. A greater understanding of the factors that lead to teacher attrition was explored through examining the pathway to the classroom and then what type of school setting in which novice teachers were placed. Using databases from Washington, the researchers studied the labor market decisions for teachers across 20 different teacher preparation programs over a 22-year period resulting in responses from 20,527 unique teachers with a combined experience of more than 124,800 years of service. Researchers focused on K-12 teachers entering the classroom during the 1989-1990 school year and studied them for a period of eight years. Results from the findings suggest that 15.5 percent of teachers (19,344 teachers) left their current school while nearly half of the group that left (7 percent or 9,672 teachers) left Washington public schools entirely (Goldhaber & Cowan, 2014). This research did not address the direct reasons why teachers left one school to relocate to another, but did indicate that several factors influenced decisions such as

opportunities for increased pay, a perception of improved collegial environment, or opportunities to teach certain levels of students (i.e., students in Honors courses and Advanced Placement courses) (Goldhaber & Cowan, 2014). This research further examined attrition rates and their correlation to type of preparation program, school environment, and state of licensure. Teacher data collected suggested that types of preparation programs do play a role in attrition when teachers report that they do not feel adequately prepared for classroom instruction and classroom management. Though research by Goldhaber and Cowan (2014) suggested classroom instruction and management as areas in which teachers wanted to feel prepared, the data were not specific concerning what particular elements of the classroom instruction, such as pedagogical strategies, or the elements of classroom management that teachers felt they needed from their program of study

Researchers have analyzed teachers and their likelihood to leave the field of teaching by collecting data from surveys on the characteristics and abilities of individuals in the teaching profession. These findings suggest that ability of the teacher education candidate does impact attrition. The research went on to conclude that higher ability college students, while not likely to enter teaching, are less likely to exit the field if they do enter teaching (Hanushek & Pace, 1995). However, Hanushek & Pace (1995) further assert that though high-ability students are likely to pursue other careers, which might provide more opportunities for financial gain, the high ability students who do choose to enter the field of education do so for the intrinsic rewards. The research suggests that individuals who display high ability in undergraduate study and enter the field of teaching upon graduation and subsequent certification are generally retained. Examination of new public school teacher cohorts in Missouri beginning in 1990 through the 2000-2001 school years collected demographic information as well as the previous educational experience of new teachers in order to determine the characteristics of students entering teaching programs (Podgursky,

Monroe, & Watson, 2004). The survey data collected reported that teachers who had higher ACT scores at college admission were more likely to leave the field of teaching. These data provide evidence contrary to that of Hanushek and Pace (1995) as they suggest that high achieving college students are just as likely to leave the field of education as others college students. The study further concluded that teachers who had obtained degrees from highly selective undergraduate institutions were more likely to leave the field of education for other career opportunities.

Teacher Professional Development

Teacher professional development is considered to be the in-service continuation of professional skill development beyond a teacher's initial training and qualification (Stevenson, Hedberg, & O'Sullivan 2016). Literature on the relationship between professional development opportunities and teacher attrition suggests that there is a correlation between positive professional development and decreased rates of attrition. Positive professional development is categorized as learning opportunities that meet the diverse professional needs of teachers within the context of their practice (Darling-Hammond, 2003). Becker and Riel (1999) conducted an investigation that surveyed 4,000 teachers, from grades 4-12, across 1,100 schools, both urban and rural, that suggests teachers who engage in more collaborative professional development trend towards more constructivist classroom practices. By providing meaningful professional learning that is situated in their context, teachers may be more willing to participate in the learning opportunities.

Research conducted by Hixon, Ravitz, and Whisman (2012) explored extended professional development for experienced PBL teachers in the area of more effectively implementing the project based learning modality. Conducted in West Virginia, the study surveyed forty-two teachers who had been previously been trained in PBL and who were

identified as experienced users of the model. For the purposes of the study, an experienced teacher was considered as someone who had successfully published a project in the state's peer reviewed PBL project library. Conclusions from this study suggest that teachers who participated in the PBL focused professional development experience reported that more opportunities for meaningful professional learning were necessary to fully equip them for their effective PBL implementation into their classroom practice. The teachers reported that the program had a positive effect in improving teachers' classroom practice of implementing 21st century skills (Hixon et al., 2012). Opportunities for professional learning that are strictly directed at improving the PBL instruction may improve practice in the classroom. Relating back to the larger issue of attrition, when teachers feel effective in their practice through participating in professional learning that directly impacts their PBL knowledge and skills, they are less likely to leave the field (Blumenfeld et al., 1991)

While directing professional development towards improving PBL implementation is seen as beneficial to teachers, the use of inconsistent lecture and discussion of PBL as a PD approach are not enough to adequately prepare teachers. A shift must take place in how professional development is delivered, including both the method of delivery and the duration, to teachers that consists of incorporating constructivist practices. In a study of 1,027 mathematics and science teachers (who participated in constructivist based teaching models) provides an analysis of what pedagogical approaches affect professional learning/development (such as hands-on learning, peer led learning, and learning provided through an outside resource (such as a content area expert external to the district) have on teacher learning (Garet, Porter, Desimone, Birman, & Yoon, 2001). The findings revealed that professional development is more effective when it is more intensive, including at least 50 hours of direct and indirect contact and utilizes a delivery method that engages teachers, such as PBL, in the process of constructing their knowledge. This contact is not necessarily

all classroom time, but may incorporate other activities such as observations or interactive activities. Further the findings from Garet et al. (2001), suggest that when professional development has a focus on curriculum through the implementation of activities other than lecture, it gives teachers necessary practice, a more hands on approach, and is more likely to be integrated and relevant to their daily practice. These findings, when aligned with the previously discussed results of Buchanan, et al., (2013) suggest that when professional development focuses on applicable skills that mirror the instructional practices of teachers, teachers find it to be more beneficial to improving their practice (Buchanan, et al., 2013; Garret, et al., 2001)

Finally, research suggests that when a "mentor," defined as a colleague with positive and effective experience in the field, is used in a program of professional learning, teacher retention rates can be positively affected (Fuller, 2003; Holloway, 2001; Smith & Ingersoll, 2004; Wilson, Darling-Hammond & Berry, 2001). Research conducted with more than 3,000 beginning teachers via survey suggests that those who experienced professional learning through a mentorship program in their first year of teaching were less likely to leave the field (Smith & Ingersoll, 2004). Further the study provides evidence that the more varied types of support that the teachers experience, through administrative support or support from mentor teachers the lower the likelihood of attrition. On average, 29 percent of beginning teachers either changed schools (15 percent) or left teaching (14 percent) (Smith & Ingersoll, 2004). The teachers who left the school environment and the field of teaching leave for various reasons including leaving to find better employment opportunities and working conditions (Yost, 2006). Yost (2006) goes on to suggest that these movers are younger individuals who have not been invested in the field of education for a significant length of time. The study also provides data supporting the claim that for the 16 percent of the respondents who received no mentorship their probability of attrition was approximately 40 percent. When

professional learning provides the necessary framework of colleague support and opportunities for curriculum instruction improvement, teachers feel more supported by the environment in which they are practicing and report being less likely to leave the field of teaching.

Teacher Efficacy

Efficacy is defined as the amounts of confidence individuals have in their ability to complete tasks successfully (Yost, 2006). When applied to the educational context, teacher efficacy refers to the ability of teachers to adequately address issues within classroom practice. Bandura (1982) as well as Pajares (1996) assert that the higher a teacher's sense of efficacy is reported, the greater the levels of effort, persistence and resilience they will demonstrate. While most research in the area of teacher efficacy focuses heavily on how teachers feel about their own practice, one qualitative research study conducted attempted to survey teachers and worked to compile an accurate representation of the complexity of teachers' daily requirements (Yost, 2006). The respondents in the survey were a group of 17 volunteers from 450 practicing teachers and had previously been enrolled in the same undergraduate teacher education program at a liberal arts university. The data for the study were collected through interviews with administrators, interviews with second year teachers, and observations of teaching performance. Teachers were asked questions about how their day-to-day interactions with others affected their own thoughts about the effectiveness and efficiency of their work. Though the tool utilized for these observations was not discussed in the findings, the study concluded that although the teacher education program had prepared the teachers adequately for classroom practice, the support that teachers received from administrators also played a role in the teachers' sense of efficacy. Yost, asserts that when teachers did not evaluate their day-to day interactions with their peers and administrators as positive, their own practice was impacted in a negative way leading them to feel negatively

about their classroom teaching performance. When teachers do not feel positively about the work they are participating in, whether through feeling underprepared, under skilled, or under qualified, improving teachers' preparation through professional learning could potentially alleviate some of these issues that trend towards teacher attrition (Darling-Hammond, 2006).

School Environment

Research conducted on teachers' mobility in the professional context of the Chicago public schools examined multiple reasons surrounding why teachers leave the classroom (Allensworth, Ponisciak, & Mazzeo, 2009). In this way, the researchers gained a better understanding of the drivers behind teachers' decisions to leave their classroom. The study examined teacher personnel records from 2002 through 2007 with 24,848 teachers and 27,643 secondary teachers. The primary focus was to explore and document whether or not teachers remained in their positions from one year to the next. Further, the study explored the characteristics of the students and the schools and the correlation of those characteristics to teacher attrition. The study found that when teachers are placed in classrooms with a level of student performance that they did not feel prepared for; whether lower or higher levels of students, lower levels of efficacy were reported and higher levels of attrition were experienced (Allensworth et al., 2009).

Research exploring other environmental factors related to organization including compensation rates and teaching assignments also was also found to have an impact on teacher attrition. A study examined teacher, student, and organizational factors associated with high levels of turnover in California schools (Loeb, Darling-Hammond, & Luczak, 2005). In this study 1,071 California teachers representing 1018 schools in 370 school districts were surveyed in January of 2002. The design of the study measured whether teachers reported that their school has a turnover issue, whether teachers reported that

vacancies are hard to fill, and the proportion of beginning teachers in the schools. The findings suggested that factors such as salary, working conditions such as level of students' performance, number of students per class, number of content areas taught in one day, and proportion of low-income students' factor into teacher retention rates.

Research focused on school environmental factors has also found connections to teacher retention. In a study conducted by Weiss (1999) explored information collected from a school and staffing survey given teachers in the 1987-1988 school year and the 1990-1991 school year. The 5,000 teachers involved in the study were first year teachers. The study provides findings that suggest that, when school morale is high, it was perceived by teachers that the school administration had played a significant role in the development of the positive school culture (Weiss, 1999). Data from the same study also concluded that increased levels of teacher autonomy played a role in increased levels of positive school morale. When teachers feel effective at their position, they are more willing to invest in the overall vision for the school. Further the study concludes that these environmental factors are the highest predictors of a teacher remaining in the field of education. Among the factors that lead to retention, teacher efficacy and autonomy ranked highest in increasing school morale (Weiss, 1999).

Teacher Retention

As teachers continue to leave the field of education, it becomes increasingly important for administrators and leaders in the field to focus on the characteristics that lead towards teacher retention and avoid those factors that are related to teacher attrition. Research on the topic of teacher retention highlights positive abilities of teachers to be flexible and meet address various concerns such as adjusting to teaching demands, managing colleague and parent relationships, understanding the cultural contexts of school and coping with the clash between expectations of pre-service teaching and the realities of in-service

teaching (Buchanan, 2013; Ewing & Smith, 2003; Fetherstone & Lummis, 2012). These studies indicated that when teachers display these positive abilities, they are more likely to be retained. Further, recommendations from the literature suggest that a reduction of teaching load, participating in relationships with professional teaching associates, participating in meaningful professional development, and additional support for new teachers could all be factors in increasing the likelihood of retention (Buchanan et al., 2013; Manuel, 2003). As previously discussed, research by Buchanan and colleagues used teacher interviews to determine the impact that workload and support from coworkers can have on early career teachers. Findings from the study suggest that new teachers are more likely to be retained when their workload is carefully monitored to ensure that they are not feeling overwhelmed, a characteristic defined in this study as leading to teacher attrition (Buchanan et al., 2013). Manuel, 2003, further supports this claim in the assertion that novice teachers must be provided with opportunities to participate in professional development that is applicable to practice and be provided opportunities to collaborate with colleagues. In this study of 22 early career teachers defined as teachers in their first four years, secondary English teachers were surveyed concerning their practice and the likelihood of leaving the field of teaching. Findings suggest that the workload of preparing for curriculum instruction is indicated as a factor that may influence the likelihood of attrition (Manuel, 2003). The workload of preparing for curriculum instruction is defined by the study as the many various tasks taken on by teachers that include planning of the scope of curriculum instruction, organizing the sequencing of learning, and preparation for individual units and activities. Further conclusions from the study suggest that isolation from colleagues support in these areas of preparation for instruction is also a factor that may lead toward attrition (Manuel, 2003). Specific traits of teachers who are more likely to leave the profession are those who report that they have experienced a lack of adequate preparation to become teachers (Darling-

Hammond, 2003). Further, teachers who are likely to stay in the field display an ability to recover from issues and persevere in the face of obstacles (Bobek, 2002).

The constructivist model of learning provides many significant suggestions for improving content instruction and improving the learning environment (Hixon et al., 2012). However, it is imperative for teachers to be adequately trained in the PBL model to ensure appropriate instruction. Providing this framework for curriculum instruction, as it takes place, allows the teacher to fully understand their role in the constructivist model. The project based learning environment requires a teacher who understands the role of a teacher and how differently they must view the classroom from the traditional modality of teaching. Further, the constructivist perspective highly encourages the focus of learning to be on the student and their interaction with the learning experience. The constructivist view encourages a self–directed environment (Holt-Reynolds, 2000) in which students take the lead in their own learning, leading the role of the teacher to change dramatically. Teachers who take part in a traditional four year teacher preparation program are less likely to leave the field than teachers who matriculate from emerging modalities such as problem-based or project based learning education programs (Boyd, Grossman, Lankford, Loeb, & Wyckoff, 2006). Boyd et al. (2006) go on to suggest that when an emphasis is placed on the constructivist perspective in teacher education programs, a teacher may better understand their role in a project based learning program and may report higher levels of efficacy. As teacher efficacy increases, teacher attrition rates also increase (Hughes, 2012). As teachers gain a better understanding of how they are directly impacting learning in a student-driven classroom such as a PBL classroom, they are more likely to remain in their current position.

Discussion and Conclusions

The literature supports the existence of multiple variables that are related to attrition rates among PBL teachers. The findings suggest that these variables: teacher preparation, classroom management, teacher efficacy, and environmental support serve to impact teachers and may play a role in attrition. The literature, with regards to teacher preparation, school environment, professional development models, and teacher efficacy emphasizes a need to examine current practices in order to determine if professional development is adequately preparing teachers for implementation of project-based learning. It remains necessary to first determine if teachers identify a connection between current professional development models and efficacy concerning their implementation of PBL. If a connection is identified, an intervention in the area of project based learning professional development approaches should be considered.

While much research has been conducted concerning the benefits of the PBL approach for students in the classroom and much research has been conducted concerning teacher attrition, no research has been conducted on teacher attrition when engaged in a school that emphasizes the PBL modality. The needs assessment will provide the necessary data for any future intervention that may arise from the findings of the study.

Research Questions for the Needs Assessment

From an analysis of the existing literature, the following questions were composed concerning the issue of teacher attrition in project-based learning and guided the needs assessment.

1. To what degree do teachers feel prepared for the PBL model of instruction?
2. What factors lead to teacher attrition in PBL schools?
3. To what degree does professional development impact teacher efficacy and attrition?
4. How does environment of mentoring impact retention of PBL teachers?

Chapter 2

Assessing Needs of Novice Teachers in Project-Based Learning

Founded in 2010, New Tech at Ruston High School (NTR) stands as a technology based PBL division of an existing public high school, or what is commonly referred to as a school within a school. Serving students at the secondary level in grades 9-12, the school enrolls a diverse population of students, ranging from students who are working towards a career certification, who are identified as potentially receiving a high school diploma that does not meet the criteria for a four-year college or university, to advanced placement students. Beginning in 2010 with a freshman class of 125 students, the NTR program provides students with a self-guided, individualized approach to learning. NTR began with a staff of five teachers and two administrators, adding curriculum instruction staff each year as the program expanded one grade each year to finally encompass grade twelve. On average, NTR loses four staff members (20%), including administrators and teachers, each school year out of a total of 20 faculty members. Over the course of its nine-year PBL focus, 24 faculty members (64.8%), of the 37 teachers and administrators who have been a part of the PBL program, joined the program and each within four years of service have left the program. Of these individuals, two administrators were promoted to other positions within the district, eight teachers left to return to a non-PBL classroom, and eight teachers are no longer in the field of education. Only one member of the original NTR staff remained with the program throughout its five years of existence.

In the 2014-2015 school year, the NTR staff consisted of one administrator and 20 teachers. This staff serves as a division (17%) of the larger high school faculty. The larger high school faculty employs 115 non-PBL teaching faculty members with an average turnover rate of nine members (7.8%) per year over the last five years. While attrition seems to be affecting both the NTR staff and the larger school staff, eight teachers have moved

between the two groups in the last 5 years. These movements have included six teachers moving out of project-based learning and two teachers moving into the PBL program. Teacher attrition can have negative impacts on the greater functioning of a school such as decreased instructional cohesiveness and decreased student achievement (Bryk & Schneider, 2002). Moreover, "effective" schools, schools that meet or excel the state and national educational standards, display the characteristics of effective planning and implementing a coherent curriculum and sustaining positive relationships among teachers (Newmann, Smith, Allensworth, & Bryk, 2001). Due to the negative effects of teacher turnover on schools and students, attrition remains a concern for key stakeholders of the NTR program. These stakeholders include: district administrators, school administrators, students and families of students. Also, included in the stakeholder group are experienced teachers, as they are frequently the faculty who mentor new teachers as they enter classroom practice.

Method

The following section contains information on the design of the research project. The discussion will include a description of the participants and their recruitment, the measures used, data collection processes, and data analysis.

Participants Online Survey

Because of the concern surrounding the issue of attrition among project-based learning teachers, survey data collection includes an online anonymous survey sent to project based learning teachers involved in the New Tech Network. The New Tech Network is a for-profit organization of PBL coaches who work with schools, districts, and communities to provide project-based learning coaching services and support that enable schools to implement PBL and create innovative schools that promote deeper learning. This network currently consists of 125 schools in 28 of the states in the United States and Australia that

instruct curriculum through a PBL approach serving nearly 72,000 students. These schools leverage constructivist research detailing how people learn in order to create an effective teaching and learning environment. The group of individuals who received the survey included approximately 2,000 male and female PBL teachers, coaches, or administrators of varied years of experience. All respondents were PBL teachers, PBL coaches, or administrators of PBL schools. The same survey was sent to administrators, curriculum coaches, and teachers. A limitation of the needs assessment survey was that no demographic data on gender, age, race, or ethnicity was collected. However, demographic data was collected concerning the respondents' degree path, degree obtained, and experience both in teaching and with PBL, the table below displays these characteristics.

Table 2.1

Summary of Demographic Teacher Characteristics, n =121

Characteristic	*n*	%
Years of Overall Teaching Experience		
1 year	10.0	8.3
2-3 years	10.0	8.3
4-5 years	12.0	10.0
6+ years	88.0	73.3
Years of Teaching PBL Experience		
1 year	38.0	31.4
2 years	30.0	24.8
3 years	20.0	16.5
4 years	11.0	9.1
5+ years	22.0	18.2
Highest Degree Obtained		
Bachelor's Degree	47.0	39.2
Master's Degree	62.0	51.7
Post-Graduate Degree	11.0	9.2
Entry into Education		
Education/Curriculum Instruction Degree	96.0	80.0
Alternative Certification Program	20.0	16.7
Teach for America	4.0	3.3

Measures/Instrumentation

Data were obtained via an online survey hosted by SurveyGizmo (Appendix A). The Research Division of the New Tech Network coordinator approved the survey for dissemination. The measure sent to the respondents was researcher created and focused on the ways that PBL practice was affected by methods of teachers' preparation for classroom service, teachers' professional development opportunities, school environmental support, and teachers' efficacy concerning PBL practice. Surveys were disseminated at a national PBL teacher conference in July of 2015. The New Tech Annual conference is held each year to provide administrators, teachers and counselors with intensive professional learning on PBL strategies. The annual conference provides novice teachers with introductory PBL sessions as well as peer-led professional learning sessions for experienced PBL teachers. The goal of the conference is to provide members of the New Tech Network with an opportunity to interact and learn from one another in a collaborative environment. Teachers from multiple states participated in the survey. In the survey, respondents were asked to provide demographic data, questions one through seven, as well as responses about their involvement using the PBL model. All survey questions are listed in the table below and can be found in Appendix H. The survey measure, which was researcher created, focused on examining the driving factors suggested by research that are associated with teacher attrition: teachers' method of preparation, school environment satisfaction, satisfaction with professional learning, and levels of efficacy. There was face validity of the measure based on conversations with Johns Hopkins course professors knowledgeable in the area. However, other measures of validity were not carried out and therefore that is a limitation of the study. A Cronbach's Alpha was conducted with a high internal reliability of .909.

Table 2.2

Research Questions and Needs Assessment Questions

Research Question	Survey Questions
1. To what degree do teachers feel prepared for the PBL model of instruction?	8. My degree program/certification program explored multiple perspectives of learning and classroom instruction. 9. My degree program/certification program explored the PBL modality in depth. 10. My degree program/certification program adequately prepared me to be a PBL teacher. 11. My degree program/certification program adequately prepared me to design and implement rigorous projects in the classroom. 12. Based off of my degree program/certification program I feel confident about my ability to implement PBL at a rigorous level. 13. My degree program/certification program explored multiple perspectives of learning and classroom instruction. 14. My degree program/certification program explored the PBL modality in depth 15. My degree program/certification program adequately prepared me to be a PBL teacher. 16. My degree program/certification program adequately prepared me to design and implement rigorous projects in the classroom. 17. Based off of my degree program/certification program I feel confident about my ability to implement PBL at a rigorous level.
2. What factors lead to teacher attrition in PBL schools?	18.My school setting provides multiple avenues for learning such as PBL or traditional class settings.

	19. My school believes that PBL is a valuable modality of learning.
	20. My district and school administrators see the value of PBL
	21. My district and school administrators fully support PBL teachers and the implementation of PBL.
	22. Other teachers at my school fully support the implementation of PBL.
	23. My school provides a support system to help me improve my PBL facilitation.
	24. The support system in my school is well developed and provides multiple opportunities for professional learning.
	25. Professional learning is a priority in my school
	26. My school/district values the advancement of and the furthering of my education as a teacher.
	27. My school/district provides opportunities for the advancement of my PBL skillset through professional learning.
	28. Teachers in my school are consistently involved in developing their PBL skillset.
	40. I can successfully implement PBL in my classroom at a rigorous level.
	41. My knowledge of PBL has directly influenced my classroom practices at a high level.
	42. My PBL implementation is a beneficial practice for my students.
	43. My PBL implementation has improved during my time of using the model in my own classroom.
	44. I feel that my students will succeed in the future based off of their involvement in PBL.

	45. I feel supported by my school administration/coaches in my PBL implementation.
3. To what degree does professional development impact teacher efficacy and attrition?	29. My district/school requires professional learning to take place during the school year. 30. My district/school monitors the professional learning requirements of teachers. 31. My district school requires me to create a professional development plan including teacher professional learning. 32. The professional learning opportunities that my school/district has provided are individualized to meet my needs. 33. The professional learning opportunities provided by my district/school are beneficial to my practice 34. I believe that my practice has improved as a direct result of teacher professional learning. 35. My PBL specific professional learning has prepared me for the implementation of PBL curricula in my classroom. 36. My district/school has ongoing professional learning that helps me improve my PBL facilitation. 37. The professional development at my school/district has helped me become a better PBL teacher. 38. My school/district provides opportunities to further develop my PBL skills such as teacher certification and or becoming certified as a PBL trainer. 39. I feel supported and encouraged by PBL certified teachers, trainers, and/or coaches at my school as they help me develop into a better PBL teacher.

4. How does environment of mentoring impact retention of PBL teachers?	No needs assessment survey questions focused on mentoring and its impact on retention.

Procedures

Teachers completed the survey voluntarily during the summer of 2015. Various methods of advertisement for participating in the survey were used including social media posts as well as flyers handed out to teachers as they completed registration for the New Tech Network national conference. If respondents chose, upon completion of the survey they could opt to be included in a random drawing for incentives in the form of gift cards using the provided demographic information. Both the flyers as well as the social media posts on Twitter, Instagram, and Facebook included the digital link to the survey. Seven demographic questions were included on the survey. Three questions addressed their type of teacher preparation as well as the characteristics of the method of preparation, including whether they had a focus on PBL or constructivist approaches to learning, with Likert-scale questions. The Likert scale responses were informed using the *Likert-type Scale Response Anchors* (Vagias, 2006). The Likert scale ranged from 1 representing (*Not True: this statement is never true in my context*), 2 representing (*Somewhat True: this statement is true less than 50 percent of the time in my context*), 3 representing (*Generally True: this statement is true 50-75 percent of the time in my context*), to 4 representing (*Very True: this statement is true 75 percent or more of the time in my context*). Six questions measured the teachers' perceptions of general support from the school environment concerning PBL implementation, eleven questions focused on the availability of and the quality of professional learning opportunities in PBL, and the final six questions addressed teacher efficacy concerning PBL classroom practice. Teachers were allotted two weeks post conference to complete the survey and 121 surveys were completed during this time period.

In the area of teacher preparation, the survey examined the perceptions of teachers concerning the method of preparation in which they participated and whether or not they felt prepared by that method for PBL instruction. In the area of professional development opportunities, teachers were surveyed for their level of involvement in professional learning in their school. The survey further explored professional development opportunities that were specific to PBL and asked respondents about the availability of the PD and the quality of the PD content and instruction. Questions concerning the support in the school environment for PBL variable explored whether teachers felt supported in the instruction of PBL and the development of their PBL skill set by the school in which they practice. Finally, the area of teacher efficacy was explored through examining whether or not teachers felt about their ability to bring about student achievement via PBL practice.

Data Analysis

In order to investigate the online survey data, (Appendix H) the author reviewed the survey responses for overarching codes and themes for connections to the various research questions. A specific examination was carried out to identify any responses related to attrition and teacher preparation, environmental characteristics, and professional learning. In order to clarify the data collected, descriptive statistics were used to identify themes and patterns associated with the factors related to the problem of practice. Specific survey questions were compared using SPSS for the frequency of response on the given demographic characteristics mentioned above. By examining the data for frequency of response, means, and standard deviations concerning the demographic data, analysis of need can be made for the support that may benefit project based learning teachers. Further, the percent scores on the research questions were used to determine how teachers perceived their method of preparation, the PBL professional development in the received, their level of

efficacy concerning their PBL implementation, and their perceptions of support that they received.

Limitations

Several limitations exist that may have led to data being skewed. First, it must be considered that teachers who participated in the survey were at a national conference for PBL. It should be considered that if a district is likely to provide financial support for teachers to attend the conference that they may value PBL at a greater level. To individuals responding to the survey via personal computer, the survey showed multiple questions at a time whereas, the survey on a mobile device only showed one question at a time. Also, the length of the survey measure must be considered a limitation. At more than 40 questions, some respondents may have found the measure to be too lengthy for completion. Finally, the data collected suggests that eighteen out of the 121 responses (12.9 percent) were surveys that were found to be partially incomplete.

Key Findings

Teacher Preparation

In order to address the needs assessment research question: "*To what degree do teachers feel prepared for the PBL model of instruction?"* Teachers were asked questions about whether or not their degree program explored project based learning and prepared them for project based learning instruction in the classroom. Given the teacher attrition factors survey, respondents reported that their teacher preparation program of study did not adequately prepare them for the project-based learning modality (See Table 2.2). Individuals who had obtained a BA in education, 29.5 percent reported that the statement "*My degree program explored PBL in depth"* was not true of their degree program. Further, of the respondents who had obtained a MA, 60.2 percent reported that the same statement was *"Not*

True." When the same statement was analyzed based on certification route, the majority of respondents suggested that the statement was "*Not True."* The data also suggest that a teacher's involvement in a degree program in recent years does not indicate a greater likelihood of PBL involvement.

Table 2.3

Teacher Preparation Question: My Degree Program Explored PBL in Depth, n = 121

Characteristic	Not True *n* (%)	Somewhat True *n* (%)	Generally True *n* (%)	Very True *n* (%)
Education				
Bachelor's Degree (*n*=47)	26 (29.5)	11 (57.9)	7 (87.5)	3 (50.0)
Master's Degree (*n*=62)	53 (60.2)	7 (36.8)	0 (0.0)	2 (33.3)
Post-Graduate Degree (*n*=11)	8 (9.1)	1 (5.3)	1 (12.5)	1 (16.7)
Certification Route				
Education (*n*=85)	70 (79.5)	15 (78.9)	6 (75.0)	5 (83.3)
Alternative Cert. (*n*=20)	15 (17.0)	2 (10.5)	2 (25.0)	1 (16.7)
Teach For America (*n*=4)	2 (2.3)	2(10.5)	0 (0.0)	0 (0.0)
Years of Teaching Experience				
1 year (*n*=10)	1 (1.1)	4 (21.1)	2 (25.0)	3 (50.0)
2-3 years (*n*=10)	7 (8.0)	1 (5.3)	1 (12.5)	1 (16.7)
4-5 years (*n*=12)	8 (9.1)	3 (15.8)	1 (12.5)	0 (0.0)
6 or more years (*n*=88)	71(80.7)	11 (57.9)	4 (50.0)	2 (33.3)
Years of Teaching PBL Experience				
No Experience (*n*=38)	24 (27.3)	9 (47.4)	2 (25.0)	3 (50.0)
1 year (*n*=30)	22 (25.0)	4 (21.1)	2 (25.0)	2 (33.3)
2-3 years (*n*=20)	13 (14.8)	3 (15.8)	3 (37.5)	1 (16.7)
4-5 years (*n*=11)	11 (12.5)	0 (0.0)	0 (0.0)	0 (0.0)
6 or more years (*n*=22)	18 (20.5)	3 (15.8)	1 (12.5)	0 (0.0)

In order to determine whether or not PBL teachers felt equipped by their degree program, the statement "*My degree program adequately prepared me to be a PBL teacher"* (Table 2.4) was evaluated. Teachers responding to the measure indicated that their degree programs did not equip them for PBL classroom facilitation. In a closer examination of the data, 44% *(n*=54) of the respondents who attended a traditional education program indicated that the program did not prepare them for PBL facilitation, while only 4.1% *(n*=5) of respondents suggested that their education certification prepared them for PBL work. In examining years experience the data show that 49.5% (n=60) of respondents who had been

teaching for six years or more indicated that the statement concerning preparation was "*Not True"*.

Table 2.4

Teacher Preparation Question: My degree adequately prepared me to be a PBL teacher, n = 121

Characteristic	Not True *n (%)*	Somewhat True *n* (%)	Generally True *n* (%)	Very True *n (%)*
Education				
Bachelor's Degree	25 (34.7)	13 (43.3)	7 (7.5)	2 (33.3)
Master's Degree	42 (58.3)	12 (40.0)	4 (0.8	2 (33.3)
Post-Graduate Degree	5 (6.9)	5 (16.7)	11(91.7)	1 (16.7)
Certification Route				
Education/Curriculum Instruction	54 (75.0)	27 (90.0)	9 (75.0)	5 (83.3)
Alternative Certification Program	16 (22.2)	2 (6.7)	1 (8.3)	1 (16.7)
Teach For America	2 (2.8)	1(3.3)	1 (8.3)	0 (0.0)
Years of Teaching Experience				
1 year	2 (2.8)	1 (3.3)	5 (41.7)	2 (33.3)
2-3 years	4 (5.6)	4 (13.3)	1 (8.3)	1 (16.7)
4-5 years	6 (8.3)	6 (20.0)	0 (0.0)	0 (0.0)
6 or more years	60 (83.3)	18 (60.0)	6 (50.0)	3 (50.0)
Years of Teaching PBL Experience				
No Experience	20 (27.8)	9 (30.0)	7 (58.3)	2 (33.3)
1 year	21 (29.2)	6 (20.0)	1 (8.3)	2 (33.3)
2-3 years	11 (15.3)	5 (16.7)	3 (25.0)	1 (16.7)
4-5 years	7 (9.7)	2 (6.7)	0 (0.0)	1 (16.7)
6 or more years	13 (18.1)	8 (26.7)	1 (8.3)	0 (0.0)

Further, in looking at the mean scores from the data collected 88.4% of respondents (*n* = 107) also reported that their degree program or certification program did not explore PBL in depth in order to prepare them to design and implement rigorous projects in the classroom, which is an integral part of PBL.

School Environment

As evidenced previously the school environment is considered to be a factor that may have an impact on teacher attrition. In order to better understand how the school environment concerning the implementation of PBL may impact teachers, respondents were asked questions about whether or not they felt administrative and district support. (Table 2.5) Teachers who had no experience with PBL (38.9%) indicated that they felt the statement concerning PBL valuation was *"Very True."* This was also found to the be the case among teachers with more than six years experience in the field of education as 65.3% (*n*=47) of those respondents indicated that the statement was also *"Very True."*

Table 2.5

School Environment Question: My district and school administration see the value of PBL, n = 121

Characteristic	Not True *n* (%)	Somewhat True *n* (%)	Generally True *n* (%)	Very True *n* (%)
Education				
Bachelor's Degree	0 (0.0)	5 (27.8)	8 (26.7)	34(47.2)
Master's Degree	1 (100.0)	11 (61.1)	17 (56.7)	33 (45.8)
Post-Graduate Degree	0 (0.0)	2 (11.1)	4 (13.3)	5 (6.9)
Certification Route				
Education/Curriculum Instruction	0 (0.0)	15 (83.3)	24 (80.0)	57 (79.2)
Alternative Certification Program	2 (100.0)	3 (16.7)	5 (16.7)	11 (15.3)
Teach For America	0 (0.0)	0 (0.0)	0 (0.0)	4 (5.6)
Years of Teaching Experience				
1 year	0 (0.0)	0 (0.0)	1 (3.3)	9 (12.5)
2-3 years	0 (0.0)	1 (5.6)	3 (10.0)	6 (8.3)
4-5 years	0 (0.0)	1 (5.6)	2 (6.7)	9 (12.5)
6 or more years	4 (100.0)	16 (88.9)	24 (80.0)	47 (65.3)
Years of Teaching PBL Experience				
No Experience	0 (0.0)	5 (27.8)	5 (16.7)	28 (38.9)
1 year	1 (100.0)	4 (22.2)	8 (26.7)	17 (23.6)
2-3 years	0 (0.0)	3 (16.7)	5 (16.7)	12 (16.7)
4-5 years	0 (0.0)	3 (16.7)	2 (6.7)	6 (8.3)
6 or more years	0 (0.0)	3 (16.7)	10 (33.3)	9 (12.5)

Also, concerning the school and district environment of support for PBL implementation, teachers were asked to indicate the truthfulness of the statement; "*My district and school*

administrators fully support PBL teachers and the implementation of PBL" (Table 2.6). Teachers with six or more years experience (45 respondents) indicated that they felt supported while teachers with no experience (27 respondents) also agreed that the statement concerning support was *"Very True"*.

Table 2.6

School Environment Question: My district and school administrators fully support PBL teachers and the implementation of PBL, n = 121

Characteristic	Not True *n* (%)	Somewhat True *n* (%)	Generally True *n* (%)	Very True *n* (%)
Education				
Bachelor's Degree	0 (0.0)	6 (37.5)	11 (31.4)	30(44.1)
Master's Degree	2 (100.0)	8 (50.0)	20 (57.1)	32 (47.1)
Post-Graduate Degree	0 (0.0)	1 (6.3)	4 (11.4)	6 (8.8)
Certification Route				
Education/Curriculum Instruction	1 (50.0)	13 (81.3)	28 (80.0)	54 (79.4)
Alternative Certification Program	1 (50.0)	2 (12.5)	7 (20.0)	10 (14.7)
Teach For America	0 (0.0)	0 (0.0)	0 (0.0)	4 (5.9)
Years of Teaching Experience				
1 year	0 (0.0)	0 (0.0)	2 (5.7)	8 (11.8)
2-3 years	0 (0.0)	0 (0.0)	5 (14.3)	5 (7.4)
4-5 years	2 (100.0)	1 (6.3)	2 (5.7)	9 (13.2)
6 or more years	0 (0.0)	15 (93.8)	26 (74.3)	45 (66.2)
Years of Teaching PBL Experience				
No Experience	1 (50.0)	3 (18.8)	7 (20.0)	27 (39.7)
1 year	1 (50.0)	2 (12.5)	10 (28.6)	17 (25.0)
2-3 years	0 (0.0)	5 (31.3)	3 (8.6)	12 (17.6)
4-5 years	0 (0.0)	3 (18.8)	4 (11.4)	4 (5.9)
6 or more years	0 (0.0)	3 (18.8)	11 (31.4)	8 (11.8)

Professional Development

In order to evaluate the needs assessment research question "*To what degree does professional development impact teacher efficacy and attrition?"* teachers were asked to respond to statements concerning their involvement in professional development as well as professional development with a project based learning focus. Respondents were asked to evaluate the statement "*My school/district values the advancement of and the furthering of*

my education as a teacher" (See Table 2.7). Regardless of level of degree or certification route, respondents indicated that they felt that they were supported in the furthering of their education as teachers.

Table 2.7

Teacher Professional Development Question: My school/district values the advancement of and the furthering of my education as a teacher, n = 121

Characteristic	Not True *n* (%)	Somewhat True *n* (%)	Generally True *n* (%)	Very True *n* (%)
Education				
Bachelor's Degree	1 (100.0)	10 (38.5)	11 (29.7)	25 (45.5)
Master's Degree	0 (0.0)	15 (57.7)	20 (54.1)	25(45.5)
Post-Graduate Degree	0 (0.0)	1 (3.8)	6 (16.2)	4 (7.3)
Certification Route				
Education/Curriculum Instruction	0 (0.0)	19 (73.1)	31 (83.8)	44 (80.0)
Alternative Certification Program	1 (100.0)	6 (23.1)	6 (16.2)	7 (12.7)
Teach For America	0 (0.0)	1 (3.8)	0 (0.0)	3 (5.5)
Years of Teaching Experience				
1 year	0 (0.0)	1 (3.8)	1 (2.7)	8 (14.5)
2-3 years	0 (0.0)	1 (3.8)	2 (5.4)	7 (12.7)
4-5 years	0 (0.0)	2 (7.7)	3 (8.1)	7 (12.7)
6 or more years	1 (100.0)	21(80.8)	31 (83.8)	33 (60.0)
Years of Teaching PBL Experience				
No Experience	0 (0.0)	3 (11.5)	13 (35.1)	22 (40.0)
1 year	0 (0.0)	8 (30.8)	8 (21.6)	14 (25.5)
2-3 years	0 (0.0)	6 (23.1)	5 (13.5)	9 (16.4)
4-5 years	1 (100.0)	2 (7.7)	3 (8.1)	4 (7.3)
6 or more years	0 (0.0)	7 (26.9)	8 (21.6)	6 (10.9)

Further, the data further indicate that the respondents with a traditional education degree suggested that they felt like opportunities existed to enhance their PBL skills by responding that the statement "*My school/district provides opportunities for the advancement of my PBL skillset through professional development"* with 15.7% *(n*=19) of respondents indicating "*Somewhat True" and 27.8% (N*=34) indicating "*Generally True."*

Table 2.8

Teacher Professional Development Question: My school/district provides opportunities for the advancement of my PBL skillset, n =121

Characteristic	Not True *n* (%)	Somewhat True *n* (%)	Generally True *n* (%)	Very True *n* (%)
Education				
Bachelor's Degree	0 (0.0)	9 (34.6)	13 (31.0)	25 (48.1)
Master's Degree	1 (100.0)	13 (50.0)	25 (59.5)	23 (44.2)
Post-Graduate Degree	0 (0.0)	4 (15.4)	4 (9.5)	3 (5.8)
Certification Route				
Education/Curriculum Instruction	0 (0.0)	19 (73.1)	34 (81.0)	43 (82.7)
Alternative Certification Program	1(100.0)	6 (23.1)	6 (14.3)	7 (13.5)
Teach For America	0 (0.0)	1 (3.8)	2 (4.8)	1 (1.9)
Years of Teaching Experience				
1 year	0 (0.0)	1 (3.8)	3 (7.1)	6 (11.5)
2-3 years	0 (0.0)	1 (3.8)	3 (7.1)	6 (11.5)
4-5 years	0 (0.0)	1 (3.8)	5 (11.9)	6 (11.5)
6 or more years	1(100.0)	23 (88.5)	30 (71.4)	34 (65.4)
Years of Teaching PBL Experience				
No Experience	0 (0.0)	6 (23.1)	11 (26.2)	21 (40.4)
1 year	1 (100.0)	7 (26.9)	11 (26.2)	11 (21.2)
2-3 years	0 (0.0)	3 (11.5)	8 (19.0)	9 (17.3)
4-5 years	0 (0.0)	5 (19.2)	3 (7.1)	3 (5.8)
6 or more years	0 (0.0)	5 (19.2)	9 (21.4)	8 (15.4)

Efficacy

As the level of efficacy of classroom practice has been found to be an influential factor in teacher attrition, teachers were asked in the survey to evaluate statements concerning based on the level truthfulness as applied to their context of practice. In the area of efficacy, most teachers responded that they felt positively about their work as PBL teachers. As reported by the data, this was clearly evident in teachers who have been in the field for a longer period of time. One of the statements evaluated was "*I can successfully implement PBL in my classroom at rigorous level"* (See Table 2.9).

Teachers with greater levels of experience (six years or more) in teaching indicated that the statement concerning their abilities in implementing PBL at a high level were "*Generally*

True" (45 respondents) *and "Very True"* (27 respondents). This was also true of teachers who had six or more years of PBL experience.

Table 2.9

Teacher Efficacy Question: I can successfully implement PBL in my classroom at a rigorous level, n = 121

Characteristic	Not True *n* (%)	Somewhat True *n* (%)	Generally True *n* (%)	Very True *n (%)*
Education				
Bachelor's Degree	2 (66.7)	4 (21.1)	28 (42.2)	13 (39.4)
Master's Degree	1 (33.3)	12 (63.2)	33 (50.0)	16 (48.5)
Post-Graduate Degree	0 (0.0)	2 (10.5)	5 (7.6)	4 (12.1)
Certification Route				
Education/Curriculum Instruction	2 (66.7)	13 (68.4)	53 (80.3)	28 (84.8)
Alternative Certification Program	1 (33.3)	3 (15.8)	11 (16.7)	5 (15.2)
Teach For America	0 (0.0)	2 (10.5)	2 (3.0)	0 (0.0)
Years of Teaching Experience				
1 year	0 (0.0)	3 (15.8)	6 (9.1)	1 (3.0)
2-3 years	1 (33.3)	0 (0.0)	7 (10.6)	2 (6.1)
4-5 years	0 (0.0)	2 (10.5)	7 (10.6)	3 (9.1)
6 or more years	2 (67.7)	14 (73.7)	45 (68.2)	27 (81.8)
Years of Teaching PBL Experience				
No Experience	3 (100.0)	11 (57.9)	20 (30.3)	4 (12.1)
1 year	0 (0.0)	4 (21.1)	18 (27.3)	8 (24.2)
2-3 years	0 (0.0)	3 (15.8)	11 (16.7)	6 (18.2)
4-5 years	0 (0.0)	1 (5.3)	6 (9.1)	4 (12.1)
6 or more years	0 (0.0)	0 (0.0)	11 (16.7)	11 (33.3)

The statement "*My PBL implementation is a beneficial practice for my students.* " (See Table 2.10) was also evaluated by teachers in order to better understand teacher efficacy concerning PBL practice. Regardless of degree, path of certification, experience in education or experience in PBL the majority of respondents indicated that they felt that PBL was a beneficial practice for students.

Table 2.10

Teacher Efficacy Question: My PBL implementation is a beneficial practice for my students, $n = 121$

Characteristic	Not True *n* (%)	Somewhat True *n* (%)	Generally True *n* (%)	Very True *n* (%)
Education				
Bachelor's Degree	1 (100.0)	1 (11.1)	20 (45.5)	24 (36.4)
Master's Degree	0 (0.0)	6 (66.7)	19 (43.2)	37 (56.1)
Post-Graduate Degree	0 (0.0)	1 (11.1)	5 (11.4)	5 (7.6)
Certification Route				
Education/Curriculum Instruction	1 (100.0)	6 (66.7)	32 (72.7)	57 (86.4)
Alternative Certification Program	0 (0.0)	2 (22.2)	8 (18.2)	9 (13.6)
Teach For America	0 (0.0)	0 (0.0)	4 (9.1)	0 (0.0)
Years of Teaching Experience				
1 year	0 (0.0)	1 (11.1)	1 (9.1)	5 (7.6)
2-3 years	1 (100.0)	0 (0.0)	3 (6.8)	6 (9.1)
4-5 years	0 (0.0)	0 (0.0)	5 (11.4)	7 (10.6)
6 or more years	0 (0.0)	8 (88.9)	32 (72.7)	47 (71.2)
Years of Teaching PBL Experience				
No Experience	1 (100.0)	5 (55.6)	14 (31.8)	18 (27.3)
1 year	0 (0.0)	1 (11.1)	14 (31.8)	15 (22.7)
2-3 years	0 (0.0)	3 (33.3)	4 (9.1)	13 (19.7)
4-5 years	0 (0.0)	0 (0.0)	5 (11.4)	6 (9.1)
6 or more years	0 (0.0)	0 (0.0)	7 (15.9)	14 (21.2)

Further, a confirmatory factor analysis was conducted on the survey results with a net of 116 participants. The items in the survey loaded on the initial four constructs as designed (F1 – Teacher Preparation, TPREP, F2 – Professional Development, PD, F2 – Setting, SET, and F4 – Classroom Practice, CLSPRD), indicating strong construct validity. All items loadings these factors were significant. Key fit statistics were reviewed in the confirmatory factor analysis; an RMSEA (Root Mean Square Error Of Approximation) of 0.101, CFI (Confirmatory Fit Index) and TLI (Tucker Lewis Index) or 0.746 and 0.730 respectively, and SRM R (Standardized Root Mean Square Residual) of 0.089 illustrated a reasonable fit to the four major factors for a needs assessment. Conducting the confirmatory

factor analysis supported the instrument's reliability in the testing for the four constructs found in the literature review.

Appendix H includes the items included in each of the four factors.

Table 2.11

Confirmatory Factors Analysis for Project-Based Learning Teacher Survey, n = 116

Factor Loading	Two Tailed	Estimate	Est./S.E.	P-Value
F1 BY				
TPREP01	0.554	0.074	7.482	0.000
TPREP02	0.654	0.088	7.420	0.000
TPREP03	0.776	0.081	9.533	0.000
TPREP04	0.875	0.030	29.279	0.000
TPREP05	0.795	0.053	14.915	0.000
TPREP06	0.558	0.070	7.957	0.000
TPREP07	0.785	0.053	14.887	0.000
TPREP08	0.860	0.035	24.545	0.000
TPREP09	0.880	0.033	26.446	0.000
TPREP10	0.843	0.035	24.247	0.000
F2 BY				
PD01	0.399	0.102	3.922	0.000
PD02	0.387	0.089	4.368	0.000
PD03	0.497	0.085	5.886	0.000
PD04	0.489	0.086	5.667	0.000
PD05	0.704	0.051	13.698	0.000
PD06	0.782	0.052	15.006	0.000
PD07	0.776	0.042	18.596	0.000
PD08	0.551	0.094	5.860	0.000
PD09	0.856	0.039	22.168	0.000
PD10	0.867	0.029	30.136	0.000
PD11	0.695	0.058	12.079	0.000
F3 BY				
SET01	0.664	0.072	9.237	0.000
SET02	0.691	0.068	10.213	0.000
SET03	0.675	0.071	9.500	0.000
SET04	0.536	0.082	6.579	0.000
SET05	0.862	0.032	27.208	0.000
SET06	0.876	0.028	31.729	0.000
SET07	0.716	0.058	12.345	0.000
SET08	0.677	0.065	10.446	0.000
SET09	0.832	0.043	19.176	0.000
SET10	0.604	0.077	7.818	0.000
SET11	0.640	0.071	9.053	0.000
SET12	0.686	0.073	9.435	0.000

F4 BY				
CLSPRD01	0.817	0.042	19.586	0.000
CLSPRD02	0.881	0.037	23.844	0.000
CLSPRD03	0.823	0.058	14.207	0.000
CLSPRD04	0.869	0.042	20.752	0.000
CLSPRD05	0.696	0.067	10.377	0.000
F2 WITH				
F1	0.150	0.098	1.532	0.126
F3 WITH				
F1	0.166	0.084	1.969	0.049
F2	0.907	0.028	32.657	0.000
F4 WITH				
F1	0.160	0.084	1.901	0.057
F2	0.434	0.093	4.568	0.000
F3	0.512	0.090	5.685	0.000
SET02 WITH				
SET03	0.831	0.043	19.438	0.000
PD06 WITH				
PD05	0.545	0.070	7.743	0.000
TPREP07 WITH				
TPREP02	0.551	0.099	5.558	0.000
PD03 WITH				
PD02	0.533	0.099	5.391	0.000
TPREP09 WITH				
TPREP04	0.549	0.120	4.590	0.000

Teacher professional development as a means of developing the skills of practicing classroom teachers plays a significant role in creating opportunities for teachers and administrators to collaborate, give input, setting classroom pedagogy and practices, and assessing impact on student learning goals (Borko, 2004; Desimone, Smith & Frisvold, 2007; Smith, Desimone, Baker, & Ueno, 2005; Desimone, Hayes, Frisvold & Smith, 2005). To be effective in the classroom implementation of effective instruction, teachers must be involved in long-term professional development (Hunsaker & Johnson, 1992; McLaughlin & Marsh, 1978). In a study of 25 teacher professional development programs, Blank, de las Alas & Smith (2008) found that the programs that demonstrated the greatest impact on teacher

development and student outcomes included more than 50 hours of professional development, continuous mentoring, alignment to pedagogy and curriculum, and ongoing teacher collaboration. Teachers' lack of appropriate professional development may be a possible component of attrition (Buchanan, Prescott, Schuck, Aubusson, Burke, Louviere, 2013). Buchanan, et al. (2013) explored the activities of 329 early career teachers in their first three years of teaching and consisted of both elementary and secondary level teachers all of whom, graduated from their teaching preparation program in 2005 or 2006. Through semi-structured interviews conducted with the early career teachers data collected indicated that as teachers participated in professional development on a consistent basis, that they found to be beneficial to their professional improvement, their desire to remain in the profession increases (Buchanan, et al., (2013). Research findings from Buchanan, et al. (2013) can be correlated with findings from the National Center for Education Statistics (Carter, 2004) which reported that dissatisfaction with a lack of opportunities for professional development was a key factor in a teacher choosing to transfer to other employment opportunities or find a different career path all together.

Through the data collected, a clearer understanding of the ways that teachers view their method of preparation, view professional development, rate their efficacy and perceive the support of their instructional environment can be found. In addressing the research question one "*To what degree do teachers feel prepared for the PBL model of instruction?"* the data collected, suggests that the method of preparation of teachers may play a role in the ways that teacher feel concerning their PBL practice. Further, the perception of support in the school environment, professional development targeted at PBL skills, and teacher efficacy of PBL teachers may impact current PBL practice. Though the needs assessment did not ask any direct questions about teacher attrition, it did indicate that many of the indicators of teacher attrition were apparent in the surveys collected. Further, the assessment data suggest

a need for more specific research into the area of PBL and the factors that may be driving PBL teachers towards leaving teaching or moving to a non-PBL position. Based on the literature it seems that the characteristic of teachers feeling under prepared by their pre-service programs, are placed in an environment that does not support their PBL practice, with no opportunities for development and feel less than effective in their work may be connected to attrition. Further research must be conducted in order to determine which of the variables provides an actionable opportunity for intervention.

Chapter 3

Intervention Literature Review of Professional Development for Project-Based Learning

Through the careful examination of the major drivers of teacher retention in project-based learning, two major areas emerged as possibilities for focal intervention in this study. First, the content of teacher preparation, whether or not the program prepared teachers for project-based learning instruction, emerged as the most immediate area for impact teacher retention in a project-based learning school setting. The earlier in teachers' learning and certification process that they are made aware of project-based learning instructional strategies, fewer issues with implementation of PBL may be encountered in practice. Specifically, by exposing pre-service teachers to curriculum and models of instruction, feelings of decreased efficacy may be ameliorated (Velthuis, Fisser, & Pieters, 2014). And although this research was not specific to exploring project based learning it may be applicable in the project based learning environment. However, impacting the preparation of teachers candidates, at the higher education level, in the instructional strategies for effective PBL, would require a more time consuming and wide-spread effort than the implementation of PBL focused professional development for practicing teachers embedded within a given setting. The second area for potential impact, teacher professional development, also emerged as a way to increase teacher retention in project-based learning. Through the implementation of PBL focused professional development, teachers currently in classroom practice, that incorporates PBL, may increase their knowledge of PBL and their efficacy concerning PBL implementation, factors that may play a role in increasing teacher retention.

General Approach The Literature Search

In order to identify and select relevant articles for this synthesis of teacher professional development, searches were conducted in various databases to locate applicable peer-reviewed articles including EBSCOHOST, ERIC, JSTOR, Education Full Text, and PsychInfo. Articles were limited to seminal texts and publications from the past fifteen years. Databases were explored using the following research terms: *project-based learning, PBL, problem-based learning, individualized learning, professional development, professional learning, mentoring, online professional learning, teacher attrition, teacher retention, teacher efficacy, teacher certification,* and *teacher preparation.* Reference lists of articles obtained through these searches and Internet searches also resulted in the inclusion of some older but relevant theoretical articles and studies that are considered classic or seminal references.

Inclusion and Exclusion Criteria

All literature included in this chapter were published in English. All research included must have been conducted either at the secondary or higher education level in order to present relevant information for the investigation of the intervention presented in this chapter. All research must have detailed their instrumentation and methodology in order to ensure rigor, confidence in the findings, and relevance to the study.

Review of the Literature

Professional Development

Professional development is the systematic effort to bring about change in the classroom practices of teachers, in their attitudes and beliefs, and in the learning outcomes of students (Ball & Cohen, 1999; Guskey, 2002; Saderholm, Ronau, Rakes, Bush, & MohrSchroeder, 2017; Yoon, Duncan, Lee, Scarloss, & Shapley, 2007). As the study seeks

to understand the impact of project based learning focused professional development on teachers practicing PBL, the search of the literature on professional development focused on the constructivist perspective of learning which is the foundational learning theory of project based learning. Also, in order to understand the elements that create effective professional development, criteria were extended to a general search of professional development among all learning models, which reveals a broad range of publications ranging from guidelines for organizing effective professional learning to research on the implementation of professional development. Most frequently, the literature suggests that although calls for high quality professional development for teachers are often present as a result of educational policy reform, rarely do these opportunities meet criteria such as being clearly focused on learning goals, engaging in active learning opportunities, consisting of sufficient duration, and having a focus on specific content area knowledge (Garet, Porter, Desimone, Birman, & Yoon, 2001; Loucks-Horsley, Hewson, Love, & Stiles, 1998).

Professional Development Reform

Many district, state and national policies in the past have initiated reforms that have caused foundational shifts in what children learn and how they are taught. As a result of these reforms, professional learning of teachers must shift in order to meet the needs of students (Boyle, Lamprianou, & Boyle, 2005). For example, teachers must move away from traditional lecture styles towards more student-centered models of instruction (Saulnier, Landry, Longenecker, & Wagner 2008). The national *No Child Left Behind* (2001) (NCLB) policy mandated that high quality professional learning for teachers should take place in order to implement new changes in curriculum. However, no guidance was provided to explain what constitutes "high quality" professional development. As reform in professional development takes place, a great emphasis has been placed on its role in developing teachers who are able to both increase student engagement and increase student achievement

(Darling-Hammond, 1997). Much of the changes that are taking place in education as a result of the *No Child Left Behind* legislation require an emphasis on adapting the components of professional development that pertain to developing and enhancing classroom practice as well as shifting towards and emphasis on college and career readiness through engaging models of instruction such as PBL (Darling-Hammond, 1997). Changes in curriculum instruction to more student centered models that benefit student achievement will undoubtedly require learning on the part of teachers and will be difficult to implement without support and guidance from administration on the district, state, and national level (Ball & Cohen, 1999; English & Kitsantas, 2013; Putnam & Borko, 1997; Wilson & Berne, 1999). Educational reform has placed an increased focus on student achievement and improving schools, which has led to a concentrated effort towards improving teachers' professional learning (Darling-Hammond, 1997). As these reforms have been initiated, professional development has begun to adapt and change (DeMonte, 2013; Stewart, 2014). Some of these changes reflect the need of professional development to meet the needs of teachers within their current context (Guskey, 2002; Saderholm, et al., 2017). The Guskey model, as previously stated in Chapter 2 is founded on evaluating professional development for the ways that it impacts participants‘ learning, the support provided via the organization through professional development, the participants usage of new skills, and the impact of the PD on student learning outcomes (Guskey, 2002). Often, this type of professional development must be created in order to impact the participants appropriately. The PrimeD framework designed by Saderholm, et al. (2017) creates effective PD by identifying participants' needs and then using the identified needs to design a series of PD sessions. By using this framework, the professional development is tailored to the strengths and weaknesses of the group and designed to meet the needs of the context and organization. Through combining these frameworks, creating and evaluating professional development can

be most impactful for working to increase teacher retention through helping teachers feel more prepared for their classroom practice.

Student Achievement and Professional Development

PBL as a learning strategy has been found to be beneficial for increasing gains instudents' achievement (Expeditionary Learning Outward Bound, 1999; New American Schools Development Corp, 1997), problem solving skills (Gallagher & Stepien, 1996; Williams, Hemstreet, Liu, & Smith, 1998), and understanding of the subject matter (Boaler, 2000). Because of the benefits of PBL to the development of students' skills and increasing student achievement, teacher professional development must be created that educates teachers on constructivist modalities such as PBL and emphasizes the ways PBL can benefit students. Further research indicates that not only should the professional development be focused on methodologies that increase student achievement, but that the learning should be presented in a similar style and manner that engages teachers in the learning process.

One study conducted by Johnson, Kahle, and Fargo (2007) indicated that teacher engagement, defined as the amount of personal vocational investment of a teacher, has a direct impact on student achievement. In a qualitative study of 11 suburban middle school teachers, the relationship between teacher participation in sustained whole school professional development (with a collaborative focus) and student achievement was explored across all course subjects. The 11 teachers participated in a summer institute of 80 hours of professional learning in the secondary science content area followed by a monthly professional development sessions during the school year that focused on implementing the instruction outlined in the course. Through this study, data collected suggest that when teachers are actively engaged in developing their practice through professional development, increases in student achievement can be correlated (Johnson et al., 2006).

Issues with PD

Though offering professional development can often be seen as a beneficial practice for school districts, often there are issues with professional development that cause it to be less than effective. In a study, conducted by Garet, Porter, Desimone, Birman, and Yoon (2001) findings indicated that while great importance has been placed on recognizing teacher professional development as a critical area that can impact student growth, the learning opportunities that are available to teachers have not always been adequate. The school systems have not provided professional learning that focuses on the ways that classrooms are changing (Borko, 2004). The occurrence of inadequate professional development, identified as professional development that was occurring but not meeting the needs of teachers, was also found in the needs assessment, conducted by the researcher in 2015, in which a national sample of PBL teachers indicated that their professional learning opportunities were not focused enough on the development of their PBL skills. Further, the literature goes on to suggest that a lack of infrastructure is often present in organizing professional development offerings for teachers, meaning that the goals and purpose for professional learning are often not clear. Further, the learning opportunities are seen as a "patchwork…formal and informal, mandatory and voluntary, serendipitous and planned" (Wilson & Berne, 1999, p.174). Instead, the infrastructure should include a clear understanding of why the professional development is taking place, a clear alignment with the learning goals of the school (in this case PBL), a clear expectation for teacher participation and finally, follow up concerning the ways that the newly learned professional development skills have been effectively implemented in order to impact student achievement (Whitworth & Chiu, 2015; Wilson & Berne, 1999). Without specifically addressing these components within the infrastructure of professional development, it is unlikely that teacher change will occur (Whitworth & Chiu, 2015). However, simply

addressing infrastructure is not sufficient to create change, professional development must contain various characteristics and components that deem it effective.

Characteristics of Effective Professional Development

In order for professional development to be effective at improving the practice of teachers, certain characteristics must be present. An example of effective professional development can be found in ongoing and job embedded development (Darling-Hammond, Chung Wei, Andree, Orphanos, & Richardson, 2009; Gulamhussein, 2013). Further, the inclusion of induction programs such as mentorship in the first year of teaching are also characteristics that have been found to be beneficial to the improvement of teaching practice through professional development (Darling-Hammond et al., 2009).

Another form of analysis created by Guskey (2002) suggests that professional development can be evaluated for its effectiveness by gauging the participants' reactions, participants' learning, the support of the organization to implement change, the participants' usage of new skills, and impact on student learning outcomes. Using these areas of evaluation, Guskey (2002) asserts that professional development can be evaluated for in order to determine whether or not activities are achieving their purposes. In the area of evaluating participants' reactions, the model poses questions via survey at the end of professional development sessions such as "Was the time well spent?" and "Did the material make sense?" Through asking these questions an understanding can be found as to whether or not individuals who participated in professional found it to be effective in meeting their needs. In the area of evaluating participants' learning, Guskey's model suggests that in effective professional development participants acquire the intended knowledge from the session. Through evaluating the support of the organization for change, effective professional development can be considered for the ways that it goes beyond instruction to a level at which the organization advocates and facilitates opportunities for change to be implemented.

Guskey (2002) asserts that effective professional development supported by the organization and creates systemic change. Effective professional development is also evaluated for its effectiveness in how well it increases the likelihood that a teacher will implement the new knowledge and skills. Beneficial and effective, professional development must be implemented by the teacher (Guskey, 2002). Finally, effectiveness in professional development can be evaluated by its impact on student learning. Ultimately, for professional development to serve its purpose, it must impact the learning that takes place in the classroom.

Ongoing Professional Development

Professional development that provides continuous support to teachers and occurs over the course of an extended period of time is more beneficial to teachers than professional development that is held infrequently or short term. Studies show that in order for professional development programs to be effective at helping teachers achieve mastery of a skill, the learning opportunities should consist of 50-80 hours of instruction, practice, and coaching (French, 1997; Heck, Banilower, Weiss, & Rosenberg, 2008; Yoon et al., 2007). While some authors suggest that PD should last for a longer duration in the 50-80 hour range, the literature gives a census that this range is the most effective. Though professional development of this type is supported by the research, the literature suggests that frequently professional development is a one-time occurrence of learning lasting anywhere from 3-8 hours (Yoon et al., 2007). A study from Opfer and Pedder (2011) asserts that, for a more complete perspective, professional learning should be viewed as a complex system rather than a one-time event. The need for professional development to consistently take place is supported by findings that suggest that sustained and intensive professional development is more likely to have an impact on teacher practice (Garet, Porter, Desimone, Birman & Yoon, 2001). These studies suggest that as professional development is designed, it must be

designed in a way that provides teachers with ongoing support as well as content that is focused on their classroom practice.

Embedded Professional Development

Job embedded professional development is considered to be teacher learning that is grounded in the daily teaching practice (Darling-Hammond & McLaughlin, 1995; Garet et al., 2001; Hirsh, 2009; Timperley, 2011). This characteristic of professional development allows for administrators to differentiate instruction for teachers seeking professional development by allowing them to focus on and learn about their specific content area and how their instruction may be enhanced. Although teachers are likely to seek out professional development opportunities individually where they attend conferences or session on their own. Embedded professional development, defined as professional development that takes place during the work-day and is specific to context is more effective and also requires the support of colleague teachers, school level administrators, as well as district administrators. Research on job embedded professional development indicated that teachers most frequently learned from professional colleagues through activities such as mentoring, coaching, lesson study, and peer observation (Wei, Darling-Hammond, Andree, Richardson, and Orphanos, 2007).

Content Focused PD

A characteristic that also indicates that professional development is effective is a deliberate focus on the specific content area of the teachers involved. Content focused PD seeks to develop activities that enhance a teacher's understanding of subject matter content and how students learn the content (DeMonte, 2013). Through implementing PD that is content focused, teachers are provided the opportunity to further develop

their content knowledge, which can be a significant factor in the area of impacting student achievement (Van Driel & Berry, 2012). In a study of secondary level teachers and their instructional planning practices, content knowledge focus was seen as a necessary element in the development of classroom skills (Harris & Hofer, 2011). In the study, seven experienced social studies teachers were evaluated for their participation in content specific professional development and then observed for how it impacted their practice. Through qualitative surveys, lesson plans, and reflections collected and analyzed during the study, teachers indicated that a focus on content in the PD had prepared them to implement the content in a more effective way. Guskey's (2002) model for evaluation further supports this idea that without a focus on meeting the direct content needs of teachers, professional development is not effective.

Designing professional development that provides teachers with an opportunity to focus on content is noted as a characteristic of effective PD; however, the form in which the PD is implemented must also be a consideration. Research indicates that professional development that focuses on content knowledge should be based on constructivist theories that allow for teachers to actively participate in the construction of their knowledge and how participation in this type of professional development impacts their current practice (Borko, 2004). Professional development that is content focused and constructivist in nature provides the opportunity for teachers to deepen their knowledge and understand how the content fits with their current practice.

PD Satisfaction

In order for teachers to actively participate with professional development and implement the learning that is gained through professional development, it must satisfy the needs that teachers have for improving their classroom practice. Literature concerning

teacher satisfaction with professional development suggests that often the opportunities are considered to be ineffective and inefficient because of a lack of focus and goals of improving classroom instruction (Hanushek, 2005; Lustick & Sykes, 2006) Further, when many teachers report on their involvement in, and their satisfaction with professional learning, often the learning opportunities are seen as "intellectually superficial, disconnected from deep issues of curriculum and learning, fragmented, and noncumulative" (Ball & Cohen, 1999, pp. 3-4). This aligns with the previously discussed findings from Guskey (2002) in that when professional development does not meet the immediate needs of teachers seeking to improve their instruction and student outcomes, it is found to be ineffective. Along with needing a clear goal for professional development, research indicates that when professional development allows for teachers to participate in active ways such as readings, role-playing, live modeling, open ended discussions with colleagues, and classroom observations the learning opportunities have been shown to be more successful (Garet, Porter, Desimone, Birman, & Yoon, 2001). In the study conducted by Garet et al., data were collected from the Teacher Activity Survey that was administered as part of the national evaluation of the Eisenhower Professional Development Program. With data from 1027 teachers from across 357 districts, their findings indicated that professional development activities that are focused on the development of teachers' pedagogical and content knowledge are beneficial in increasing student achievement. Results from the sample taken in the needs assessment support these findings in that teachers surveyed report similar experiences concerning professional learning opportunities for project based learning teachers as having the characteristics of not being very structured and without a clear goal and purpose for the professional development that takes place.

PD Impact on Efficacy

Due to low levels of teacher efficacy having an impact both on student achievement and teacher attrition, it is necessary to consider the impact that professional development could play in mitigating these issues. In a 2006 study, the ways that professional development can impact teacher efficacy was explored through 106 sixth grade teachers taking part in professional development focused on increasing mathematics efficacy (Ross & Bruce, 2007). The authors provided professional development that sought to increase efficacy concerning practice based on the work of Bandura (1977). The findings from the study identified that the treatment group outperformed the control group on three of the efficacy measures however; the results were only statistically significant in the area of classroom management (Ross & Bruce, 2007). This study concludes that while PD may not impact all areas of efficacy, certain areas may be positively impacted.

Teacher efficacy can also be impacted positively through the implementation of professional development that provides teachers with the necessary support to differentiate learning for all levels of students (Dixon, Yssell, McConnell, & Hardin 2014). In the study of 45 high school teachers from various content areas, Dixon et al, surveyed teachers using the Teacher Self-Efficacy Scale (TSES; Tschannen-Moran & Woolfolk Hoy, 2001) concerning efficacy in the areas of Instructional Strategies (including differentiation), Management, and Student Engagement. Findings from the study suggest that professional development that is focused on the contextual practice of a teacher, in this case differentiation of learning, can impact efficacy in a positive way (Dixon et al., 2014). As the design of professional development takes place, it is necessary to consider the ways that efficacy can be impacted.

Mentoring

Mentoring is defined as programs in which qualified and experienced individuals assist individuals with less experience or no experience in a specific context (Hudson, 2013;

Huling & Resta, 2001). When experienced teachers are able to collaborate with new teachers, new teachers' perceptions of job satisfaction increase (McCaughtry, Cothran, Kulinna, Martin, & Faust, 2005). In the study McCaughtry et al., (2005) observed mentoring that took place between 15 experienced teachers (teachers who had attended workshops and displayed high levels of curriculum effectiveness) and 15 novice teachers who were in their first three years of teaching. The two groups included 12 men and 18 women from various ethnic backgrounds. During the study, the mentors and mentees participated in many different types of professional development including workshops, video taped lesson exchanges, classroom visits, visiting other schools to observe instruction, and online correspondence. Using the Mentoring Functions Scale (Noe, 1988) the findings from the study indicated that the mentees in the program increased in their perceptions of self-competence. Literature surrounding teacher mentoring frequently suggests that there are many benefits to the individuals and schools who participate in a teacher-mentoring program with regards to job satisfaction (McCaughtry et al., 2005).

One of the key areas of growth can be found in the ability of mentors to help new teachers by contributing guidance and service as an avenue of advice for their career transition into education (Pogodzinski, 2015). In a study of 380 novice teachers across the Detroit metro area, Pogodzinski surveyed individuals to determine their frequency in participating in mentoring activities as well as the focus of the mentoring activities. Findings from the study suggest that when novice teachers have frequent interactions with a mentor that connection can have a positive impact on practice and can impact a teacher's future performance in both curriculum instruction as well as classroom management (Pogodzinski, 2015).

Vocational guidance is seen as a beneficial characteristic of mentoring with the nonteaching issues that new teachers face, including collaboration with peers, management

issues within the classroom and navigating conflicts with administrators and parents (Gehrke & Kay, 1984). Further, mentors can help novice teachers learn and implement curricula in the first years of teaching in a specific content area (Bey & Holmes, 1990). Several studies focused on teacher retention indicate that mentoring of novice teachers is an activity that may have an impact on increasing the likelihood of a teachers to stay in teaching, be satisfied in their career field, harbor better teaching attitudes, and implement more effective instructional practices and long term planning (Serpell & Bozeman, 1999). In a review of mentoring programs that included the states of California, Idaho, Montana, North Carolina, and the city of Toronto, Canada, Serpell and Bozeman found that induction programs that include elements of mentoring are more effective at preparing novice teachers for classroom practice which leads to retention. In addition, the administrators, of mentored teachers, note fewer problems with curriculum instruction or classroom management of teachers who are mentored (Serpell & Bozeman, 1999; Smith & Ingersoll, 2004). In a study of 3,235 novice teachers, Smith and Ingersoll identified the ways that mentoring can positively impact teacher induction and ameliorate the factors that lead to attrition and thereby increase the factors leading to retention. Using data collected via the Teacher Follow-Up Survey, the authors found that teachers who participated in a period of mentorship during induction were positively impacted. By providing teachers with mentoring support via experienced colleagues as a component of the professional development, the literature suggests that teacher retention rates can be affected in a positive way (Bey & Holmes, 1990; McCaughtry et al., 2005; Pogodzinski, 2015; Serpell & Bozeman, 1999; Smith & Ingersoll, 2004).

Mentoring can be a significant factor in decreasing attrition. The field of teaching is very challenging and frequently makes demands on teachers that can be overwhelming for experienced teachers, and potentially fatal to the careers of novice educators (Fantilli & McDougall, 2009). In the first five years in the classroom, teachers face many challenges

such as developing year-long curricula, meeting state and national standards for rigor, organizing classrooms, implementing classroom management plans, learning the organizational structure of the school, and learning how to engage diverse student populations. These challenges are likely factors that play into the thinking of novice teachers as they strive toward success or veer toward leaving the profession (Adnot, Dee, Katz, & Wyckoff, 2017). In a study of District of Columbia Public Schools, Adnot et al., found that matching novice teachers with experienced teachers can have a positive impact on school culture, faculty development, and student achievement. Among new teachers within their first five years of teaching, attrition rates and rates of teachers leaving the field of education for any reason have been as high as 30% (Adnot, Dee, Katz, & Wyckoff, 2017; Boyd, Grossman, Lankford, Loeb, & Wyckoff, 2006; National Commission on Teaching and America's Future, 2003). These attrition statistics for new teachers could be altered through a program of mentoring.

The theme of mentoring as a support in professional development is prevalent among literature surrounding the improvement of classroom instruction and increasing student achievement (Barrera, Braley, & Slate, 2010; Huling & Resta, 2001; Ingersoll & Smith, 2004). Mentoring is often seen in the literature as a supplemental occurrence that should be included among an array of professional learning opportunities (Barrera, et al., 2010). The literature further suggests that when novice teachers participate in cycles of mentoring, student achievement is increased and the characteristics of the workplace that lead to teacher attrition are decreased (Wong, 2004). In the study conducted by Wong, induction programs in five states were explored for their ability to decrease teacher attrition rates. Wong found that induction programs that include mentoring positively impact novice teachers' perceptions of support. Each of these programs were found to have established an environment that was welcoming to novice teachers, provided networks of professional

growth, and incorporate a strong sense of administrative support. The findings from Wong (2004) are further supported in a study conducted by Kent (2000). In the study, Kent's research focused on the problems novice teachers encounter. The research included 202 beginning teachers who had completed a traditional four-year baccalaureate program (159 participants) or a one-year graduate level teaching program (43 participants) in order to compare the problems that each group experienced. Kent's study explored the responses of the teachers on the Teacher Problem Checklist (Cruickshank, Kennedy, & Myers, 1974) a 105-item instrument using journal entries focused on the problems that novice teachers encounter in their practice. Problems that both groups of novice teachers encountered were similar and both groups suggested that a cycle of mentoring from more experienced teachers is likely to help novice teachers navigate their way through common challenges. The research conducted indicates that when comparing the classroom issues faced by both groups, all novice teachers, regardless of preparation program, face similar issues including classroom management and content area instructional issues.

Increasing teachers' perceptions of support appears throughout the literature as a key resulting improvement in effective mentoring programs. Research by Andrews and Quinn (2005), attempted to assess the level of support that 182 first-year teachers received via professional development, mentoring, and supports of classroom practice (such as developing classroom management plans, policy and protocol, and communicating with parents) in a school district serving almost sixty thousand students. Teachers surveyed with the 21-item questionnaire were from elementary, middle, and high schools. The survey given to teachers inquired about the perceptions of support that novice teachers received from experienced teachers and school administrators in a variety of areas; curriculum, instruction, personal and emotional support, and finding/obtaining materials for instruction. The data were all recorded and coded for the area of support provided. Because of the large number of

respondents across various schools, the data collected strongly suggest that when support is provided through a structured mentoring program instituted by administrators and carried out using experienced teachers, novice teachers feel more supported than when mentoring is not provided or is found via supportive colleagues. Of the respondents, 23 suggested that they needed more support in the areas of curriculum instruction and reported that they felt as though colleagues and administrators assumed they knew more than they did. The key findings from this study indicated that the principal, or administrator, plays a primary role in the creation of an environment of support. Findings from Andrews and Quinn (2005) suggest that schools and principals must devote more time to the induction of novice teachers and that by doing so, an environment of support can be created. Further, mentoring programs are seen as beneficial to administrators through research conducted by Ingersoll and Smith (2004). The data for this study were collected through the survey of 3,235 novice teachers via the SASS (Schools and Staffing Survey) administered by the National Center for Education Statistics. Evidence from the SASS findings suggests that when novice teachers are involved in mentoring programs, fewer problems such as student discipline or problems with curriculum instruction are reported (Ingersoll & Smith, 2004). As teachers feel more supported in their classroom management techniques and curriculum instruction by administration and experienced colleagues through mentoring programs there is a reduction of attrition factors such as a lack of efficacy concerning teaching practice and poor perceptions of environmental support.

Literature surrounding the subject of teacher mentoring heavily focuses on the concept of teacher mentor programs being effective when positive and experienced mentors were available. Unfortunately, many districts that seek to incorporate mentoring into their schools are not able to provide mentors with the formal training in the skills needed to guide the growth and development of new teachers (Ganser, 1999; Podsen & Denmark, 2000). In

research conducted by Ganser (1999), 26 Wisconsin high school teachers were surveyed concerning their involvement as mentors. Respondents were asked via survey to provide a general overview to the benefits and obstacles to delivering effective mentoring to new teachers after their participation in a mentoring cycle. Findings suggested that mentor training was frequently not expansive enough to support effective mentoring practice. Unfortunately, most districts that seek to incorporate mentoring into their schools are not able to provide formal training to mentors in the skills needed to guide the growth and development of new teachers (Ganser, 1999). Providing training to mentor teachers is a critical element to the success of a mentor teacher and their mentees. Research by Ganser (1999) asserts that training of mentors must be a priority and that the training should focus on developing the skills that are necessary for mentors to help novice teachers learn to improve daily classroom activities, such as classroom management and curriculum instruction.

School Environmental Support

The school environment in which teachers practice can be seen as a motivating factor of either attrition or retention based on the levels of support that teachers perceive both from the individuals they work with and their administrative support. Concerning the ways that leadership and relationships with peers can impact a teacher's likelihood of attrition, one study, conducted in 2012, examined 806 teachers in public elementary and high schools in order to determine the effect that teachers' perceptions of support had on the characteristics of burnout (Fernet, Guay, Senécal, & Austin, 2012). Teacher burnout is defined in the study as the characteristics of emotional exhaustion, depersonalization of the employee requirements, and reduced personal accomplishment. The study indicated that two areas were responsible for teachers' decisions to leave the classroom, the first being perceptions of being overloaded in the classroom and the second being the teachers' interpersonal relationships including support from peers as well as leadership behaviors of the principal. The authors

assert that when teachers feel overloaded, or that they are not capable of performing all of their job related tasks and do not feel supported by their peers or by the school leadership that they are likely to experience the characteristics of burnout (Fernet et al., 2012).

Discussion

Implementation of the Intervention

Implementing an effective intervention is a process in which research validated approaches are put into practice in order to meet specific needs. Prior to the implementation of an intervention, is necessary to determine whether or not an intervention is backed by evidence of its effectiveness and whether or not it will positively impact the individuals participating. Also, concerning the intervention, considerations should be made to ensure that each individual who is impacted by the change has an understanding of why the change is taking place and how it will benefit their practice (O'Connell, Hickerson, and Pillutia, 2011). O'Connell et al. (2010), assert that a properly shared and communicated institutional vision can help an organization focus on actions that lead to the achievement of a shared goal.

In further ensuring that an intervention in professional learning is fully adopted and diffused across a system, Rogers (2003) asserts that any proposed innovation must be perceived by the individuals involved as being superior to the previous manner of intervention, which has been traditional professional learning offerings, by providing a significant advantage (Rogers, 2003). Currently, the professional development that is in place at NTR meets the basic requirements of state legislation, including the necessary hours for certification, but further development of specific PBL concepts and practices are not in place. When considering a professional learning intervention in the current context of NTR, an advantage of administering professional development blended with an explicit cycle of mentoring is the provision of a specific structure for learning to take place. Adopters of the

innovation are likely to respond in a positive manner, leading towards the increased likelihood of long-term implementation. The goal of the intervention is the improvement of professional learning and the provision of support for novice teachers that increase the likelihood of teacher retention. Further, by presenting a clear vision for the purpose of the learning opportunities and a clear, well-communicated and organized plan, teachers may be more likely to actively participate in the professional learning and adopt changes into their practice.

In examining the intervention for alignment with current existing values of the NTR faculty it should correspond with the needs assessment that identified a desire by the national respondents to improve professional practice and student performance. Further, while the NTR faculty has not had significant professional learning in the area of project based learning, teachers report that the learning experiences, when they occurred, were positive in nature. All of these criteria meet indications of an intervention that is compatible with the adoptive environment (Rogers, 2003). Rogers (2003) asserts that the adoptive environment is one in which individuals are ready and willing to participate in significant changes to improve the environment in which they are participating. This readiness for change suggests that resistance to change is less likely because individuals see the benefit of that change taking place and understand how the changes will impact their practice. Teachers have shown that they want to improve their practice and existing professional learning has not met that need. Further teachers feel unsupported by their environment for the implementation of PBL in their classrooms, found from the needs assessment. By designing professional development opportunities that meet the direct needs of participants' learning, that support implementation and change, that increase the participants' usage of new skills, and create a positive impact on student learning outcomes (Guskey, 2002) teachers will be able to better work towards their own educational goals.

As changes in professional learning are created, O'Connell et al. (2011) further assert that involving others in the execution of the plan for professional development should be a consideration. A potential area for development also included the involvement of multiple stakeholders within the school environment, suggesting that as more individuals, who directly impacted by the PD, are involved in the guidance and creation that takes place of the proposed plan, the more likely assimilation of the vision will occur.

Conclusions

In the ongoing effort to increase teacher retention in PBL based schools, addressing the areas of professional learning and effective mentoring provide opportunities for an intervention to be created and implemented. Effective interventions should provide PBL teachers with a specialized understanding of the constructivist perspective of learning, provide project management techniques for the PBL classroom, and mentor novice teachers in the daily activities of PBL instruction. In order for professional learning to be successful, it must be designed in a way that is effective in alleviating the pressures that novice teachers face (Ball & Cohen, 1999). By incorporating mentoring into the professional learning experience, challenges that teachers may face can further be addressed through collaboration with highly qualified, experienced teachers (Barrera et al., 2010). Much of the research conducted on mentoring incorporates significant sample sizes with combinations of quantitative data and in-depth qualitative data through case studies and interviews. Due to the current type of professional learning currently in practice, which takes place for a minimum of six hours and a maximum of two days at the beginning and end of the school year, implementing the intervention will not likely be complex in nature (Rogers, 2003). Scheduled time already exists for professional learning through district organized professional development days. Embedding professional learning on effective PBL strategies into this time during the school schedule will not present significant challenges or require

teachers to complete the learning outside of the regular school day. Next steps for research were found in creating an intervention that provides PBL specific professional development to all teachers with a cycle of mentoring for novice teachers.

Chapter 4

Intervention Procedure and Program Evaluation Methodology

To address the growing need of support for the PBL teachers in the NTR program, the intervention involves the implementation of professional development that seeks to increase the self-efficacy of PBL teachers as well as establishing a culture of environmental support for PBL teachers through the creation of a mentoring program. As discussed in Chapter 3, professional development opportunities can impact teacher efficacy, which, in turn has an effect of teacher retention. Based on the results of the needs assessment of the NTR faculty, low levels of teacher efficacy concerning implementation of project-based learning (PBL) and negative perceptions of school environmental support have led to an environment in which teacher attrition is occurring.

Treatment through this intervention seeks to increase low levels of teacher efficacy concerning PBL implementation and low levels of perceived school environmental support are addressed through professional learning with a cycle of mentoring for novice teachers. There are several intended outcomes from this intervention. For teachers, increased knowledge of PBL and PBL techniques for curriculum instruction was a primary avenue to attempt to improve teacher efficacy (Blumenfeld et al., 1991; Hixson, Ravitz, and Whisman, 2012). Participating teachers gained tools to aid in the implementation of PBL and increase their ability to implement PBL with rigor. The teachers' increased involvement in PBL professional development is expected to increase teacher efficacy as noted in previous research findings (Bruce & Ross, 2007; Darling-Hammond, 2006; Yost, 2006). The present research study tests the hypothesis that teachers who participate in the professional development course increase usage of PBL skills and will determine whether or not PBL specific professional development can increase positive perceptions of school environmental

support. The research questions for the study assessed the evaluation method and process as well as the outcome. The research questions include:

Outcome Research Questions:

1. What components of the professional development course impact the usage of PBL strategies in classroom instruction?
2. What components of the professional development course impact PBL teacher efficacy?
3. What components of the mentoring session, as part of the PD course, impact a teacher's perceptions of school environmental support?

Research Design

The research design followed an embedded mixed methods approach in which qualitative and quantitative data were collected (Creswell & Plano Clark, 2011). By utilizing both types of data a more complete understanding of the intervention and the effect it may have on PBL teachers may be gained. Further, by exploring both types of data an understanding of the experience teachers had with the intervention may be provided. The intervention's logic model (Appendix F) illustrates the relationship between participant inputs activities, outputs, and the short, medium, and long-term intervention outcomes.

In order to determine whether or not an outcome is a result of the professional development and mentoring intervention, fidelity of the intervention must be determined. Was the intervention delivered as scheduled? Was the intervention delivered in the time frame scheduled? Were there changes to the content of delivery? A higher fidelity of implementation can help the research conclude whether or not the intervention led to the outcome.

Method

This section includes descriptions of the participants in the professional development. Further, it details the design of the intervention and the procedure for delivery and will assess the ways that the intervention was evaluated for its implementation with fidelity according to the research design. Finally, it will describe the process for data collection and data analysis.

Participants

The estimated sample size of the treatment group is 55 high school teachers using project-based learning in the 2016-2017 school year from one public high school. These individuals are employees of the Abraham school district and teach using the PBL model in various content areas including mathematics, science, social studies, English, foreign languages, fine arts, business, and technology courses. Teachers in the sample group were familiar with PBL at varying levels, with some teachers implementing PBL on a daily basis and others using it sporadically throughout the course of their curriculum. The district in which the professional development took place has requested PBL specific training for all PBL teachers. The letter of request from the district professional development coordinator can be found in Appendix A. Because the professional development sessions are being provided through the district office of teacher development, recruitment of participants for the professional development will not be needed, as the sessions are required of all teachers. But, teachers were recruited to participate in the data collection portion of the project.

Instrumentation

In order to measure the impact that the professional development intervention had on teachers' efficacy regarding PBL implementation and their perceptions of environmental support, several instruments were used. These instruments will measure teacher usage of PBL principles in classroom practice, teacher efficacy, and teacher perceptions of school

environmental support, perceptions concerning effectiveness of mentoring, and evaluation of the professional development. Teacher usage of PBL was measured using the Electronic Quality of Inquiry Protocol (EQUIP) (Marshall, Horton, Llewellyn, & Smart, 2009) (Appendix B) and address the research question *"What components of the professional development course impact the usage of PBL strategies in classroom instruction?"* The Ohio State Teacher Efficacy Survey (Tschannen-Moran & Woolfolk Hoy, 2001) (Appendix D) was used to measure teacher efficacy and address the research question "*What components of the professional development course impact PBL teacher efficacy?"* And finally, The Organizational Health Index-Secondary Schools (Feldman & Hoy, 2001), (Appendix C) was used to measure the perception of school environmental support and address the research question "*What components of the mentoring session, as part of the PD course, impact a teacher's perceptions of school environmental support?"* The Mentoring Functions Scale (Noe, 1988) (Appendix E) was used to determine teacher perceptions of the effectiveness of mentoring. Finally, the Post-Professional Development Feedback Survey (PPDFS) informed teacher feedback questions that were asked at the conclusion of each PD session. Teachers who participate in the session were asked one question concerning their experience in the session in the areas of either PBL strategy development, teacher efficacy, or perceptions of environmental support.

Electronic Quality of Inquiry Protocol (EQUIP). Because of the complex nature of inquiry learning and project based learning, developing a protocol that assesses the quality of instruction in a valid and reliable manner proves to be a difficult task. This instrument (Marshall, Horton, Llewellyn, & Smart, 2009) creates a protocol for the assessment of 19 indicators aligned with four constructs of classroom practice including: instruction, curriculum, assessment, and discourse. For teachers, the protocol provides a framework for strengthening inquiry-based instructional practice, which is similar in nature to the practices

of project-based learning. The protocol (Appendix B) is designed to evaluate teachers' classroom practice, evaluate PD program effectiveness, and provide a tool to guide reflective practitioners in increasing the quality of their instructional practices. By breaking down classroom activities into different coded areas, the measure allows for the observer to evaluate multiple classroom activities occurring simultaneously within the classroom. These codes are defined as (1) non-instructional time, when a teacher is handling administrative duties, (2) pre-inquiry, which is defined as teacher-centered instruction, (3) developing inquiry, defined as student engaged, but not student led activity, (4) proficient inquiry, which is defined as student-centered, active learning, and (5) exemplary inquiry, in which students are self-engaged in constructing their own knowledge (Marshall, et al., 2009) such as student involvement as well as the implementation of a behavior plan. As students are working the "Activity" code measure the classroom events that are facilitated by the teacher. The measure defines the activity as it takes place using the "Organization" codes such as whole class, small group, or individual work. Behavior displayed by students is measured using the "Student Attention" codes of low attention, medium attention, and high attention. The "Cognitive Code" evaluates higher order skills that are present in the lesson under observation, which is a measure of student behavior. The "Inquiry Instructional Component Code" and the "Assessment Code" are used to determine the activities facilitated by the teacher and the ways that they engage students and assess their knowledge. The measure is provided digitally via Clemson University and includes a digital webinar to provide an overview of the measure and training videos that can be used to practice scoring. The EQUIP an open source measure, provided by Clemson University, was found to have internal consistency with a Cronbach alpha score of .88, and an interrater reliability Cohen's kappa score of .61 for the nine indicators of instruction, .62 for the eight indicators of curriculum, and .55 for the nine indicators of ecology all of which fall between moderate and substantial

agreement on the Koch interpretative scale (Marshall et al., 2009). This instrument was used by the researcher pre- and post-intervention as a measure of teacher understanding and their level of implementation of the PBL professional development treatment and provide insight on the outcome research question: *What components of the professional development course impact the usage of PBL strategies in classroom instruction?* Further, the teacher demographic information, such as gender, highest degree, number of years experience, and number of years teaching the specific content were utilized to determine what role, these factors play in PBL instruction.

The Ohio State Teacher Efficacy Scale Short Form (OSTES-SF). This measure, created by Tschannen-Moran & Woolfolk Hoy (2001), seeks to determine efficacy among teachers in the areas of instructional strategies (four items), classroom management (four items), and student engagement (four Items) (Appendix D). Using a 9-point Likert scale (1 = nothing, 3 = very little, 5 = some influence, 7 = quite a bit, and 9 = a great deal) the measure was used pre-intervention as well as post-intervention to determine the efficacy of teachers. Table 4.1 identifies the item numbers and sample questions for each of the three factors in the 12-item inventory. Teachers with high scores show strong efficacy. The measure has high internal reliability with a Cronbach's alpha score of .94. Reliabilities for the teacher efficacy subscales were 0.91 for instruction, 0.90 for management, and 0.87 for engagement. Intercorrelations between the subscales of instruction, management, and engagement were 0.60, 0.70, and 0.58, respectively. This measure was used to address the outcome research question: *What components of the professional development course impact PBL teacher efficacy?*

Table 4.1

Ohio State Teacher Efficacy Survey- Factors, Item Numbers, Sample Questions (Tschannen-Moran and Woolfolk Hoy, 2001)

Factor	*N*	Item Number	Sample Question
Factor I: Efficacy for Instructional Strategies	8	1-4	To what extent can you use a variety of assessment strategies?
Factor II: Efficacy for Classroom Management	8	5-8	How well can you respond to defiant students?
Factor III: Efficacy for Student Engagement	8	9-12	How much can you do to foster student creativity?

The Organizational Health Inventory for Secondary Schools. This measure, created by Feldman and Hoy (2000) (Appendix C), seeks to determine the overall perceived support of employees. Authors of the measure suggest that when a school is considered healthy, the institutional, administrative, and teacher levels are all in harmony and the school meets functional needs as it successfully copes with external forces (Feldman & Hoy, 2000). The measure includes subtests, which determine how the variables of institutional integrity, initiating structure, consideration, principal influence, resource support, morale, and academic emphasis impact perceptions of support. Using a 4-point Likert scale (*1 = rarely occurs, 4 = very frequently occurs*) the 44-question measure explores how individuals perceive support within a secondary organization by asking respondents to indicate the extent to frequency in which various statements occur. The reliability scores for the various scales are relatively high: Institutional Integrity (.91), Initiating Structure (.89), Consideration (.90), Principal Influence (.87), Resource Support (.95), Morale (.92), and Academic Emphasis (.93). This instrument was used pre and post intervention to determine the level of perceived environmental support that teachers feel concerning their PBL classroom practice at their

school and address the research question: *What components of the mentoring session, as part of the PD course, impact a teacher's perceptions of school environmental support?*

Mentoring Functions Scale. In order to assess the participant's perceptions concerning the mentoring support provided through the professional development, an adapted version of the Mentoring Functions Scale (MFS) (Appendix E) were utilized as a post-professional development measure. The MFS is designed to determine the extent to which mentors provide career and psychosocial support to mentees. Utilizing the social learning theory (Bandura, 1977) as a foundational base, the MFS relies direct and observational learning as a basis for the acquisition of behavioral patterns, which ultimately strengthens the expectations regarding the ability to perform tasks successfully. The original MFS was developed at nine different sites across the United States and involved 139 educators and 43 mentors. In examination of the data, factor analysis of career factors and psychosocial factors was used to identify the underlying constructs assed by the MFS. Using a five point Likert-type scale ranging from one (To a slight extent) to five (To a very large extent) individuals identify the level of support and how they were challenged to grow as a professional by their mentors. Table 4.2 identifies the item numbers and sample examples for each of these factors on the 25-item inventory. Teachers with high scores indicate that mentors served the functions of providing career and psychosocial support. The measure has high internal reliability with a Cronbach's alpha score of .92 and an intercorrelation between the scales of .49 (Noe, 1988). This measure was used to address the outcome research question: *What components of the mentoring session, as part of the PD course, impact a teacher's perceptions of school environmental support?*

Table 4.2

Mentoring Functions Scale - Factors, Iterm Numbers, and Sample Questions (Noe, 1988)

Factor	*N*	Item Number	Sample Question
Factor I: Career Support (Exposure and visibility, sponsorship, and challenging assignments).	11	15- 25	My mentor helped me meet new colleagues.
Factor II: Psychosocial Support (role model, counseling, acceptance and confirmation, and coaching).	14	1- 14	My mentor has shared an alternate perspective to my problems.

As previously stated, the measure was used post-intervention in order to determine the impact, that mentoring had on individuals involved in the PBL professional development.

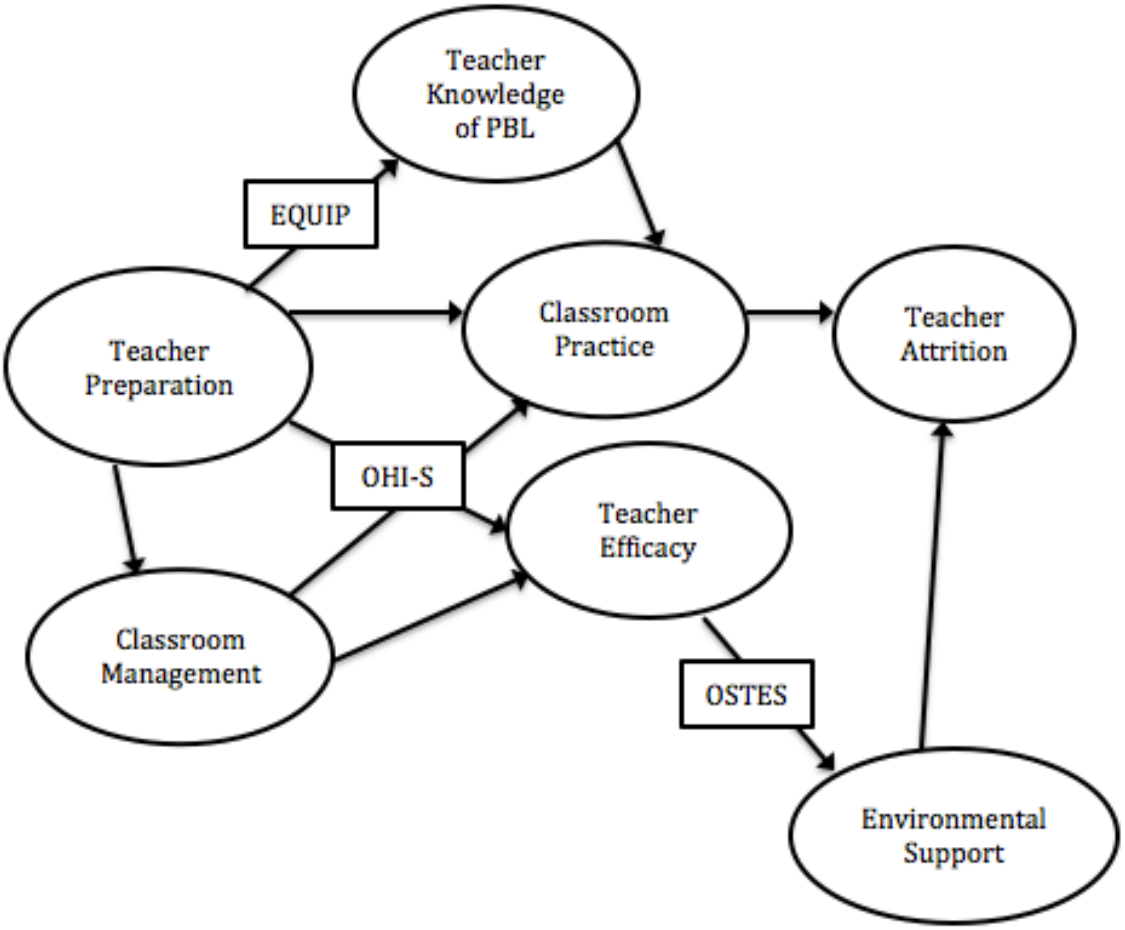
Process evaluation instruments. Two instruments were used to assess the fidelity of implementation. They include the PD instructor's journal and field notes and PD session surveys from participants.

Instructor Field Notes and Journal. This journal was used as a framework for the researcher and instructor to write field notes, which became qualitative data about the presentation of the PBL professional development. Field notes included content covered during the professional development sessions, any adjustments made to the design model, such as additions or omissions and impressions of participant engagement. This documentation was from the perspective of the instructor/principal investigator.

Post-Professional Development Feedback Survey. The Post-Professional Development Feedback Survey (PPDFS) (Appendix H) is a means through which the participants' will provide feedback concerning the strategies that they found to be effective as a result of the session. Participants will respond to one of the questions at the conclusion

of each session. Using open-ended questions concerning the effective activities of the session, responses were coded in order to determine the most useful strategies used during the professional development. Questions on the survey will focus on the session content, the participants' level of understanding, their ability to apply the strategies, their likelihood of using the strategy, and the value of the strategies. In order to determine the teachers' efficacy concerning the session, participants were asked if they felt engaged, if they found the session to be helpful to their specific practice, and if they felt respected.

Figure 4.1 *Revised Conceptual Framework*



Procedure

This section provides a description of the implementation of the intervention, including a timeline of activities and data collection procedures.

Intervention

Participants in the intervention were identified in August of 2018. After consent of participants has been obtained, professional development sessions were held twice per month for three hours each (a total of five sessions). PD sessions were focused on increasing teachers' understanding of the use of PBL instructional strategies as a part of constructivist learning. Further, the sessions will focus on PBL strategies for curriculum design and project planning. Also, mentoring sessions were held on a weekly basis for the duration of the treatment with individual teachers for 30 minutes each meeting. During these mentoring sessions, mentors were provided general questions about the PD sessions that have taken place as well as questions about the barriers novice teachers may or may not perceive with the implementation of PBL. The topics can be found in the table below.

Table 4.3

Mentoring Session Discussion Topics

Session	Topic
Session 1	PBL Implementation Issues/Project Development Check-In
Session 2	Implementation Issues/Project and Classroom Management
Session 3	Student Assessment and Project Evaluation Rubrics
Session 4	Project Implementation Issues/Project Reflection

Teachers with three or more years of PBL experience who have scored highly proficient on the previous two Louisiana COMPASS teacher evaluations were designated as mentors and paired with individuals with less than 3 years of PBL experience, designated as mentees. Prior to implementation of the intervention there are approximately 20 individuals who were designated mentors and 30 individuals who were designated as mentees. Teachers with the most PBL experience may be partnered with more than one mentee. In order to determine the impact that this may have on the perceptions of environmental support, the

researcher will identify mentors who have more than one mentee as well as mentees who are paired with one of those mentors. Mentoring sessions were focused on the implementation of the PD session materials including PBL strategies for curriculum design and project management. The sessions will also seek to build efficacy concerning PBL practice and increase perceptions of environmental support by providing mentees access to ask mentors questions.

Table 4.4

Research Matrix

Research Question	Research Instrument	Data Collection	Data Analysis
What components of the professional development impact PBL strategy usage in the classroom?	EQUIP	Post PD session 1, 2, 3, 4, 5	Paired Sample t-test
What components of the professional development impact teacher efficacy?	OSTES-SF	Pre and Post PD	Paired Sample t-test
What components of the mentoring session, as part of the PD course, impact a teacher's perceptions of school environmental support?	OHI-S	Pre and Post PD	Paired Sample t-test
	MFS	Post Mentor Sessions 1 and 4	Paired Sample t-test

Outcomes for the Intervention. The short-term outcomes of participation in the professional learning include, but are not limited to; application of PBL knowledge in lesson planning, increased efficacy concerning PBL practice and increased perceptions of support among faculty. Medium term outcomes include application of PBL skills, implementation of PBL with increased fidelity, as measured through classroom observations, and increased perceptions of school support. Long-term outcomes include an increase in teacher efficacy concerning the implementation of PBL and improved perception of school environmental

support due to the collaboration via mentoring relationships; which are projected outcomes that may lead to increased retention rates of faculty.

What follows is a description of the professional development curriculum including inputs, outputs, assumptions, and external factors as well as a detailed timeline of the events that will take place during the treatment and a logic model (Appendix F), which provides a visual of these components.

In the first three hour session of the professional development, participants will complete several surveys, including the demographic portion of the EQUIP (Marshall et al., 2009) the OHI-S (Feldman & Hoy, 2006) and the OSTES-LF. The completed data of the surveys provided by respondents will provide the baseline data for the outcome evaluation. The first session will also include a brief overview of the research outlining the benefits of PBL concerning student achievement. All of the remaining five sessions were three hours in length. These sessions included instruction by the primary researcher, then various activities that teachers were asked to complete and implement in their classrooms. During the two week period after the session, teachers were purposefully identified, using their efficacy scale score, for the first of three classroom observations using the EQUIP measure (Marshall et al., 2009). Because time does not permit for all teachers to be observed and evaluated, a selective sample was organized in order to determine how the PD is impacting classroom practice. Teachers were ranked by based on the efficacy score from the OSTES-SF from highest to lowest. The top five highest scores and lowest five scores were evaluated for classroom observation. The teachers' scores on the OSTES-SF were blind to the researcher to prevent bias on the observations. In order to achieve this, individuals for observation were determined by a source outside of the study. Two teachers from each group were selected for observation after each session.

The second PD session and all other sessions will follow a researcher-designed framework. This framework has been shaped by the principal investigator's courses in project–based learning and based on resources from the Buck Institute for Education (BIE) PBL Starter Kit (Larmer et al., 2009). Initially the session began by addressing the basic components of developing a project including: developing a conceptual framework for the project direction including assessing the required curriculum standards and incorporating them into project design, setting goals, deciding scope of the project, and writing a driving question. The driving question is an open-ended question that serves as a reference point for the high school students that will used to understand the project requirements and ultimate outcomes. Further, the driving question should set the stage and direction for the project by creating interest and curiosity about the content. An example of a driving question from a psychology class covering the course content of personality, brain functioning, and mental healthcare issues would be: *In what ways can we use the case study of Phineas Gage to better understand the regions and functions of the brain, the impacts of brain damage, and the ways that mental health can be affected by trauma in order to assess debates about mental health care provided through various insurance companies.* The first activity of the session included brainstorming from teachers to select a unit of curriculum or a project that they were using in their classroom that they will develop and update during the professional development. The second activity included a look at the necessary outcomes of the project and goal setting in order to meet the outcomes. Third, teachers will explore the scope of the project and determine the direction of the project in order to write their driving question. In order to allow opportunity for peer evaluation, teachers will participate in open forum group discussions separated by content areas concerning their barriers to success. Finally, in order to elicit feedback on the driving question created, teachers were grouped randomly to share their driving question. The other teachers in the group will provide feedback on the ways that

the question supports the direction of the project as well as the ways the question could be better crafted to support student learning. In the interval between sessions, observations of the low, medium, and high efficacy teachers will occur.

The third session will follow a researcher-designed framework consisting of brief lecture presentation, video presentation, and collaborative group discussions/feedback. Goals of the session was to assist teachers in: launching a project, understanding assessment of individual and group work, exploring the daily teaching and learning activities of a PBL facilitator, and exploring the logistics of employing PBL in classroom instruction. Also, videos of PBL instruction that has been deemed as demonstrating best practices was viewed and discussed by teachers. As they view the PBL videos, teachers will use an adapted version of the EQUIP to assess the categories of: (1) Lesson Design and Implementation, (2) Content: Propositional Pedagogic Knowledge, (3) Content: Procedural Pedagogic Knowledge, (4) Classroom Culture: Communicative Interactions, and (5) Classroom Culture: Student/teacher relationships. These evaluations will then serve as the basis for group discussions concerning the video recorded lesson. Again, in the interval between PD sessions, teachers identified in the low, medium, and high efficacy scoring teachers were observed using the EQUIP measure.

The fourth session will again follow a researcher-designed framework, informed by the PBL Starter Kit (Larmer et al., 2009), and will provide teachers with problem solving scenarios that may be encountered during the design or implementation of a PBL unit in order to practice the effectively management a project in operation. The session will highlight the necessary skills required for teachers to maximize the effectiveness of their project and the work time that students have during the project in order to support the knowledge that PBL teachers already have concerning instruction and curriculum development. While some teachers have some experience in the project based learning

environment, the information provided will continue to develop the skills of veteran PBL teachers and will provide opportunities for experienced PBL teachers to provide insight from their classroom practice. Also in this session, teachers will watch videos of two PBL lessons on video and evaluate the lesson using the adapted RTOP measure. In the interval between the fourth and the fifth sessions, teachers identified in the low, medium, and high efficacy groups were evaluated using the EQUIP measure.

The fifth, and final, session was designed to facilitate teachers' evaluation of their projects and make improvements to the design. In this session, teachers will share their project design and identify how it implements the course standards. Teachers will also be provided the opportunity to give feedback on the projects of other teachers. Further, teachers will explore the ways that literacy activities can be included in the project in order to meet state standards for literacy instruction. In the two weeks after the session, selected teachers from the low, medium, and high efficacy scoring groups were observed using the EQUIP measure (Marshall et al., 2009).

Table 4.5

Timeline of Intervention Activities

Time	Activity
August 2017	Professional Development Course • Session 1 (3 hours) o "Nice to Know You" Icebreaker Activity o Participants Complete: ▪ Consent Form ▪ Organizational Health Survey-Secondary ▪ Ohio State Teacher Efficacy Survey-Short Form ▪ Participant Demographic Survey ▪ Introduction to Constructivism and the Benefits of PBL on Student Achievement ▪ PPDFS Exit Question o Mentor/Mentee Pairing • Mentor/Mentee Session 1 • EQUIP Classroom Observations • Session 2 (3 hours) o "What do you know?" Icebreaker o Presentation: Overview of PBL: theory, benefits,

strategies and Overview of PD course plan (PowerPoint)
    - Strategy Presentation: Brainstorming/Goal Setting/Scope/Driving Question
    - Newsome Park Case Study Video (Best Practices)
    - PPDFS Exit Question
- Mentor/Mentee Session 2
- EQUIP Classroom Observations
- Session 3 (3 hours)
    - "What do you know?" Icebreaker
    - Strategy Presentation: Project Launch/Assessment/ Teacher Activities/Logistics
    - Ferryway School Case Study Evaluation
    - Discussion: Share experiences from skills practice
    - PBL Best Practices Videos/RTOP Evaluation
    - PPDFS Exit Question
- Mentor/Mentee Session 3
- EQUIP Classroom Observations
- Session 4 (3 hours)
    - "What do you know?" Icebreaker
    - Strategy Presentation: Managing the Project
    - PBL Best Practices Videos/RTOP Evaluation
    - PPDFS Exit Question
- Mentor/Mentee Session 4
- EQUIP Classroom Observations
- Session 5 (3 Hours)
    - "What do you know?" Icebreaker
    - Project Evaluation and Literacy Design
    - PPDFS Exit Question
    - Organizational Health Survey-Secondary
    - Ohio State Teacher Efficacy Survey-Short Form
- EQUIP Classroom Observations

The PD learning opportunities being provided are conducted at the request of district administrators. In an ongoing effort to train new teachers and continue training with experienced teachers, the district has requested PBL specific learning opportunities (Appendix A). Teachers are required to participate in the sessions during the allotted PD days. By using the allotted days, the intervention is supported by the research findings, which indicate that the characteristic of professional development leads towards higher levels of PD satisfaction (Wei, Darling-Hammond, Andree, Richardson, & Orphanos, 2009). Informed consent was obtained for all participants prior to the beginning of the professional development. Should any participants request additional assistance with project design or

implementation, times were made available to meet with the researcher throughout the course of the professional development sessions. Further, all sessions were video recorded and be made available to individuals who are not able to be present for a particular session. As participation in the professional development is a required by the district, individuals who are not present during the session were provided video recordings of the sessions as well as session materials and were complete the session feedback questions via email within three days of the session date.

In order to determine whether or not an outcome is a direct result of a specific intervention, the researcher must analyze and determine the fidelity of the intervention. A higher fidelity of implementation can help the research conclude whether or not the intervention led to the outcome at the conclusion of the intervention. Fidelity of implementation overview is provided to inform the research design.

Fidelity of Implementation

In consideration of research design, fidelity of implementation is a key concept that has various definitions. Most definitions for fidelity of implementation assert that there should be alignment with how an intervention is planned and how the intervention is delivered (Dusenbury, Brannigan, Falco, & Hansen, 2003; Nelson, Cordray, Hulleman, Darrow, & Sommer, 2012). For the purposes of this study, high fidelity can be linked to high specificity in the design of the professional learning course (O'Donnell, 2008). If the professional development course is presented according to the intervention plan, including session content, session duration and frequency, session participants' attendance and participation, then high fidelity should occur. As determined by Dusenbury et al. (2003), indicators in the evaluation of fidelity include adherence to the program, dosage, and quality of program delivery, participant responsiveness, and program differentiation. Further, a PBL trained teacher, who has also been trained with the EQUIP measure will evaluate selected

teachers in order to compare with the principal investigator for fidelity. Each indicator is discussed below and considered for the ways that is situated in the logic model and theory of treatment.

Indicators of adherence to program design. In this area, fidelity is measured as whether or not the content of the intervention is delivered as intended in the treatment design. Moreover, does the treatment provided in the PD sessions align with research (Dusenbury et al., 2003)? Individuals who will measure adherence to the program design are the participants, PBL teachers, and the PD instructor who is also the principal investigator. The New Tech Network has recognized the PD instructor as a nationally certified project-based learning teacher trainer. This certification was awarded after training was completed through a five-day intensive workshop during the 2014 National New Tech PBL conference as well as 20 hours of follow-up online training consisting of implementation of PBL professional development training. As a certified trainer, the instructor will take notes concerning the activities of the session that will indicate the details of the information presented in the PD as well as any modifications made to the treatment design. All documentation gathered in the daily log will then be compared to the goals of each session and comparison will occur by the instructor. Further, in order to maintain fidelity in the observations taking place a second certified PBL trainer will evaluate participants for comparison to researcher evaluations.

Indicators of intervention dose. The two primary indicators of dose are found in the attendance of intervention participants and the amount of time that the participants spend engaged in the professional development (Dusenbury et al., 2003). In order to address the indicator of intervention dose, attendance was taken at each session. Further, as the time allotted each day for the intervention was three hours per session, the activities that take place during each session were carefully planned and the instructor will note the time for instruction related to each concept.

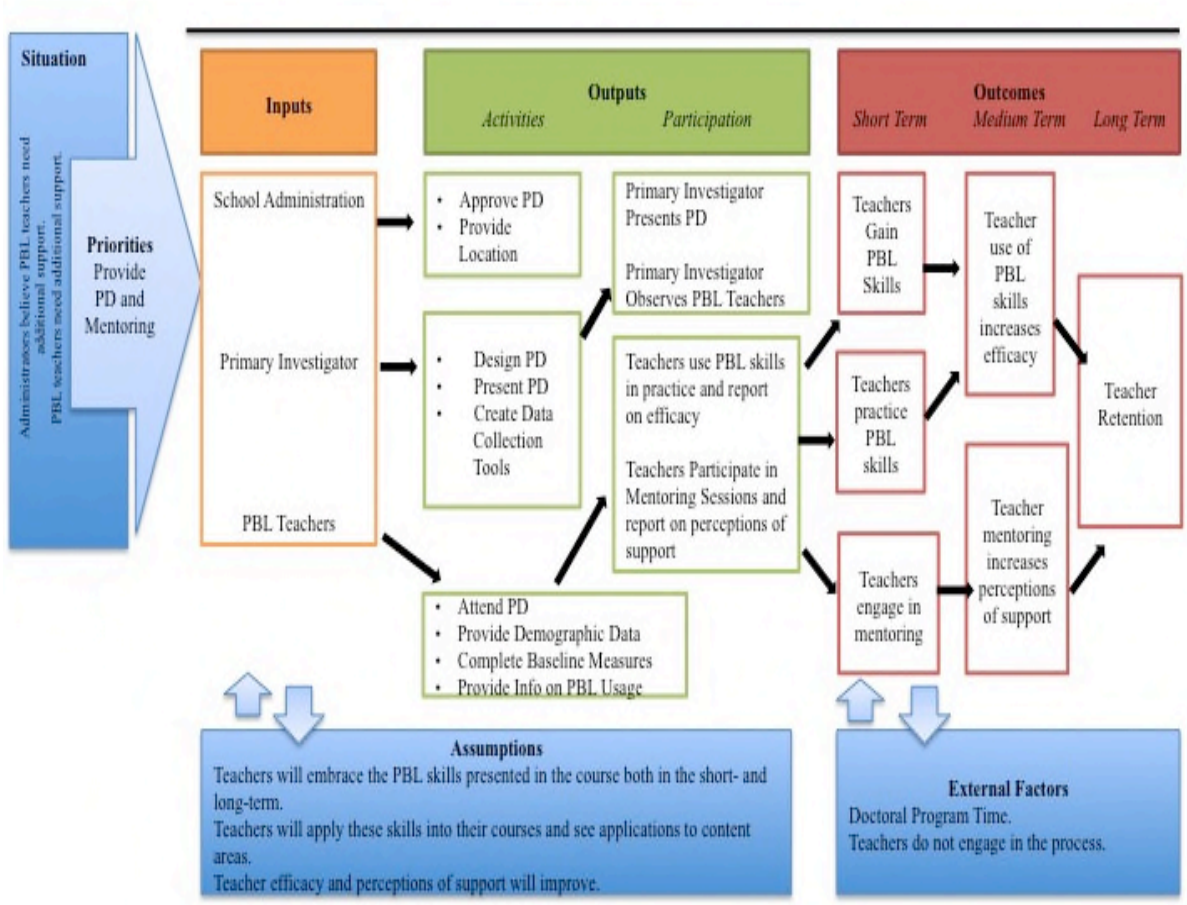
Indicators of quality of program. Instructor effectiveness and the effectiveness of the topics at addressing teachers' needs are indicators of program quality (Dusenbury et al., 2003). Instructor effectiveness was determined by the manner in which the instructor presents content in the teacher professional development sessions and leads the participants throughout the course. The professional development will model the project based learning format in order to drive participant engagement. Also, videos of effective PBL practice in action and group discussion opportunities were utilized to engage the participants. Two instruments were utilized to determine the quality indicator; first, the PPDFS (Appendix H) session summary questions were asked to all participants upon session completion. The questions will ask participants to assess the professional development by explaining what strategies impacted their PBL classroom practice, efficacy, or perceptions of environmental support.

Indicators of participant responsiveness. Investigations that focus on whether or not participants feel respected, are engaged, or find the information to be effective in improving their practice can measure participant responsiveness (Dusenbury et al., 2003). In order to measure the responsiveness of participants, teachers will complete the adapted PPDFS (Appendix H) questions given at the conclusion of each session and respond to inquiries concerning the strategies of the professional development course.

Indicator of program differentiation. As teachers may participate in various other professional development opportunities during the course of the intervention, program differentiation will compare the course content to other learning support that participants may have encountered. Documentation of these events will take place in order to determine their ultimate impact on outcomes as noted in the logic model. Through the PPDFS (Appendix H), participants will identify any strategies that the currently use in their PBL instruction.

Comments on the indicators to measure fidelity of implementation. If these indicators are appropriately assessed and are aligned with the theory of treatment which links participation in the PBL professional development with short, median, and long-term outcomes in the logic model shown below.

Figure 4.2 *Intervention Logic Model*



The priorities of the study are to provide PBL focused professional development that enhances the classroom practice of teachers as well as incorporates a cycle of mentorship for novice teachers. The logic model identifies the school administration, primary investigator, and PBL teachers as inputs. In terms of outputs, the school administration provided approval of the professional development (Appendix A) as well as a location for the PD to take place. The primary investigator designed the PD, present PD sessions, generated necessary data collection tools, and collected data. The PBL teachers will participate in the professional

development as well as provide information for data collection. Assumptions of the study are that teachers will embrace the PBL skills presented in the PD in both the short and long term through the application of the information to their content areas. Also, an assumption is that teacher efficacy concerning PBL practice and perceptions of environmental support will improve as a result of the professional development. Short-term goals of the intervention are that teachers will (1) Gain PBL skills, (2) Put the PBL skills into practice, and (3) Engage in the mentoring activities. Median term goals are that teacher efficacy concerning PBL practice will improve and that teacher mentoring will improve the perceptions of environmental support. The long-term goal of the intervention is to increase teacher retention among PBL practicing teachers. Though a longer period of observation might yield more conclusive results, an external factor in the time of study for the primary researcher will impact the intervention. Further the intervention was impacted by the teachers' willingness to engage in the intervention.

Through the utilization of a mixed methods study, collecting both qualitative and quantitative data from surveys, as well as qualitative data from the written responses, the fidelity of implementation was assessed for the professional development intervention.

Participant Materials. All participants in the course will receive a summary of the information in each PowerPoint presentation on PBL (Appendix G). Should a participant miss a session, they will receive all materials provided via the session and were required to complete any activities from the session. Participants will also receive a copy of the EQUIP measure by which classroom observations were scored as well as any other information disseminated during the course.

Data Collection

Due to constraints at the district level, all PBL teachers in the district (approximately 55 teachers) received the professional development treatment in this study. Because of this,

pre and post professional development data were collected. A mixed methods design was used collect qualitative and quantitative data (Shadish, Cook, & Campbell, 2002). Because of the lack of a control group, the design used must provide a way for meaningful data to be collected without comparison groups. Shadish et al. (2002) assert that in order to obtain meaningful data a mixed method design, assessment of participants should occur at intervals throughout the treatment. In this study, prior to the treatment, program participants were assessed for their efficacy concerning PBL practice. By collecting these data prior to treatment, a baseline for which comparisons can be made regarding teachers' implementation of PBL during and after the professional learning treatment (Rossi et al., 2003). During the time of the intervention, five high efficacy teachers and five low efficacy teachers were randomly selected for observation during the intervals between professional development sessions. By assessing the participants intermittently over the time of the intervention, data were obtained and analyzed using a paired samples t-test to determine the extent to which there is a relationship between the teacher observations and the professional development. The goal in using of the mixed methods design was to determine if the professional learning is increasing the fidelity with which teachers are implementing PBL, the efficacy that they have concerning PBL implementation, and their perceptions of school environmental support.

All quantitative data was collected via surveys and observation instrumentation. Selective sampling (Newcomer, Hatry, & Wholey, 2010) was used in order to determine 10 participants who were observed during the treatment. The selected participants were observed by the principal investigator throughout the duration of the treatment a minimum of two class periods for a minimum of 25 minutes each session. All data collected was analyzed for growth in PBL skills knowledge and implementation. As noted previously, the timeline of evaluation for the professional learning treatment was three months, from August 2018

through October 2018. Both the PD and the mentorship cycle will last for duration of three months. During these three months, mentee teachers will meet with their mentor teacher a minimum of six times for 30 minutes each session. The data collected throughout this treatment were used to determine the impact of PBL professional learning on increasing efficacy concerning PBL implementation and increasing perceptions of school environmental support on the survey measures implemented at the end of the professional development/mentoring cycle.

Data Management. All data were kept on a password-protected laptop computer. Only the principal investigator will have access to the data. All identifiers of the participants were eliminated. All surveys were disseminated using paper copies, and will be retained for a minimum of three years.

Data Analysis. Embedded mixed methods design requires the collection of both qualitative and quantitative data. The quantitative data will measure the PBL skills with a focus on instructional strategy use in classroom instruction, teacher efficacy, and perceptions of environmental support. The qualitative data collected via the adapted Post Professional Development Feedback Survey (PPDFS) questions will assess the participant's experience with the intervention and which strategies were found to be helpful, and will provide depth and descriptors to the data analysis (Creswell & Plano Clark, 2011). The qualitative data from the PPDFS were analyzed using inductive thematic coding in order to determine the themes present in the participant responses.

Quantitative data collected from the observations of teachers were analyzed using a paired sample t-test in order to determine the change over time that teachers display in classroom practice. A paired sample t-test will also be used to analyze data from the Mentoring Functions Scale (Noe, 1988) to determine change in the measure as a result of the mentoring component of the professional development. In order to determine if there is a

significant impact in the mean scores as a result of the professional development and mentoring, a paired sample t-test were used to analyze the efficacy data from the OSTES (Tschannen-Moran & Woolfolk Hoy, 2001) The same method was applied to evaluate data collected from the OHI-S (Feldman and Hoy, 2006) which measures perceptions of environmental support.

Outcome evaluation research question: Project Based Learning Skills. In order to determine change in implementation of PBL Skills, analysis of the EQUIP used a paired samples t-test to determine change as a result of the professional development. Further, demographic data were used to explore the ways that gender, age, years of experience in teaching, and years of experience in PBL each play a role in the implementation of PBL strategies.

Outcome evaluation research question: Perceptions of Environmental Support. To test any change in the teachers' perceptions of school environmental support a paired sample t-test between the pre- and post-test scores of the OHI-S were calculated to test the null hypothesis that the intervention had no impact on perceptions of environmental support. By using a paired sample t-test changes in the mean scores from pre and post intervention data will provide an understanding of the impact the professional development and mentoring may have on the each of the constructs. The following tables provide a visual representation of the research questions along with the instrumentation used, the source of the data, the frequency of collection and the data analysis used.

Table 4.6

Outcome Evaluation Matrix: Project Based Learning Skills and Usage

Research Question: "*What components of the professional development course impact PBL strategy usage in classroom instruction?*

Variable	Instrumentation	Data Collection		Data Analysis
		Source(s)	Frequency	
Input Variable Baseline PBL Awareness	EQUIP	Participants	Beginning of Intervention	Paired Sample t test
Outcome Variable PBL awareness	EQUIP	Participants	End of Session 3, 4, 5 (1)	Paired Sample t test

Table 4.7

Outcome Evaluation Matrix: Mentoring Functions Scale

Research Question: *"What components of the mentoring session, as part of the PD course, impact a teacher's perceptions of school environmental support?"*

Variable	Instrumentation	Data Collection		Data Analysis
		Source(s)	Frequency	
Mentoring Score	MFS	Participants (n=55)	Post Mentor Session 1 and Mentor Session 4	Paired Sample t-test

Table 4.8

Outcome Evaluation Matric: Perceptions of School Environment Support

Research Question: *"What components of the mentoring session, as part of the PD course, impact a teacher's perceptions of school environmental support?"*

Variable	Instrumentation	Data Collection		Data Analysis
		Source(s)	Frequency	

Environmental Support Score	OHI-S	Respondent data (n= 55)	Pre and Post Intervention	Paired t-test results

Table 4.9

Outcome Evaluation Matrix: Perceptions of School Environment Support

Research Question: "*What components in the professional development course impact PBL teacher efficacy?"*

Variable	Instrumentation	Data Collection		Data Analysis
		Source(s)	Frequency	
Teacher Efficacy	OSTES	Respondent data (n=55)	Pre and Post Intervention	Paired sample t test

Strengths and Limitations of Design

The design of this study seeks to determine the effectiveness of PBL professional learning in improving teacher efficacy concerning PBL instruction and improving perceptions of school environmental support through the collection of qualitative and quantitative participant data. Acknowledging the limitations of the design and evaluating biases are critical components of evaluating the design (Rossi et al., 2003). One key limitation of this study is the lack of a control and treatment group. Research designs featuring only one treatment group limit the ability of the data to effectively state whether or not change in practice is due to treatment or extraneous variables. Further, this study is entirely voluntary and randomization is not possible. Due to a lack of randomization within this study, Rossi et al. (2003) note that selection bias may also be a concern as a threat to validity in this study as the selection of individuals who participate may not be an accurate representation of the teaching population. Participants in the professional learning treatment may respond positively, however participants in subsequent treatment may result in negative responses. Shadish et al. (2002) suggest that a participant's knowledge of the evaluation

process can create a threat to validity. Also, external influences, or the history of the participants outside of the treatment may influence the teachers' implementation of PBL (Shadish et al., 2002).

Further, this study used self-report instruments, which are also a validity threat and a limitation of the study due to uncertainty about the truthfulness in the reporting. Though the mixed methods design has limitations, using this design will provide the most conclusive evidence provided the constraints placed on treatment. Another unavoidable limitation of the study is the relationship between the principal researcher and the participants. As the principal researcher has been a colleague with the majority of the participants some bias may take place concerning the information provided via efficacy surveys and surveys measuring the perceptions of environmental support.

Chapter 5

Novice Teacher Development Findings and Discussion

The purpose of this chapter is to discuss the findings of an intervention aimed at increasing teachers' PBL strategy use, efficacy concerning project based learning practice and perceptions of support through a project based learning focused professional development and mentoring at a public high school. While the research focused on these factors, the distal outcome could have impact on future retention rates and were tracked as an area of potential future research. The intervention occurred during November 2018-March 2019. The research questions, will frame the findings and discussion, which including how these results relate to theories and prior studies on efficacy and perceptions of environmental support.

The researcher collected both quantitative and qualitative data in order to address the following research questions:

RQ1: What components of the professional development influence PBL strategy usage in the classroom?

RQ2: What components of the professional development influence teacher efficacy?

RQ3: What components of the mentoring session, as part of the PD course, influence a teacher's perceptions of school environmental support?

The researcher also collected qualitative data in order to address the following evaluation questions concerning the study:

EQ1: Was the professional development delivered as scheduled?

EQ2: Did participants attend the professional development as intended in the design?

EQ3: Were there any changes in the delivery of the professional development?

The chapter will conclude with a discussion on how the findings from the study relate to the conceptual and theoretical frameworks and will identify and discuss the limitations

that occurred within the implementation of the study. Also, participants' reactions to and reflections on the effectiveness of the professional development sessions and the mentoring sessions were shared.

Supporting Project Based Learning Teachers

Fifty-five high school teachers participated in the professional development course and mentoring sessions during the months of November and December of 2018 and January and February of 2019. The six professional development sessions were three hours in length and focused on expanding teacher knowledge of constructivist theory, which drives PBL; strategies such as improving PBL facilitation skills through creating classroom learning projects that align with standards; formative strategies for assessing student learning; and managing the elements of curriculum instruction the PBL based classroom activities. Following each professional development session teacher participants reflected on their learning via the Post-Professional Development session Feedback Survey (PPDFS). This measure was implemented at the conclusion of each of the six PD sessions in order to understand the influence that the professional development had on practice and whether or not the goals of the sessions had been met. Also, in the time between sessions (generally three to four weeks), novice teachers were paired with experienced PBL teachers for mentoring sessions that included discussions based on the content of the PD and what they perceived as barriers to and successes in implementation of the PBL strategies in their classroom.

Prior to addressing the research questions, this section will document the process of implementing the professional development and mentoring program at a ninth through twelfth grade high school in the Abraham school district. The researcher's field notes, data from the Teachers' Sense of Efficacy Scale- Long Form (TSES-LF), the survey responses from the PPDS, and feedback from the mentoring sessions will all be analyzed to indicate the

effectiveness of the professional development components as well as to explore the teachers' perspectives concerning the value of both the PD program and mentoring sessions.

Session One

Constructivist Theory, Student Engagement, and Student Achievement

Session 1 occurred in mid November of 2018. In attendance were fifty-five teachers from various curricular areas including: English-language arts, mathematics, science, social studies, and various electives courses. In this session, all participating teachers were made aware of the purpose of the intervention and the purpose of the research measures to be used via a brief presentation. In the presentation participants were made aware that although the district required participation in the professional development program they were given the option to not have their data collected. All 55 of the participants in the professional development and mentoring course agreed to have their data collected. The researcher then grouped the teachers according to their content areas into teams of approximately four to 5 teachers. They then participated in an activity to ensure that participants had met one another and were familiar with the individuals who shared similar content interests. Content area groups were identified as mathematics, science, English-language arts, social studies, and electives courses. As the participants completed the icebreaker activity, groups were asked to complete the Teachers' Sense of Efficacy Scale- Long Form (TSES-LF). The measure was administered as a pre-test to survey respondents concerning their efficacy levels on three domains: student engagement, instructional strategies, and classroom management. After completing this measure, the researcher gave a presentation to frame the discussion topics for the session. The presentation highlighted information regarding research on constructivist theory and its benefits in the classroom as well as the benefits of PBL approaches related to student engagement and student achievement. During the presentation, participants were asked to share with their groups some of the successes and barriers they had in their

experience as PBL teachers. While teachers shared, the researcher recorded the areas of barriers and success that were shared in order to inform future PD sessions. After the first presentation, teachers were also asked to complete the Organizational Health Survey-Secondary (OHS-S) for baseline data. After completion, groups were asked to discuss and create two individual goals that they would like to accomplish as a result of participating in the future sessions. Teachers were asked to identify one goal that could be accomplished during the face-to-face professional development program, such as improving project management or improving classroom management during PBL experiences. Following the discussion, the participants completed the Post Professional Development Feedback Survey (PPDFS). To conclude the session, novice teachers, who had been previously identified as teachers with less than two years of PBL experience, were given an index card with the name and room number of the mentor teacher with whom they were partnered. The more experienced mentor teachers, who had been previously selected based on experience in the PBL classroom, were asked to schedule a mentoring session before the next professional development session. The mentors were provided with directions to discuss three essential topics in the sessions. First, to identify what content from the previous session was helpful for improving PBL theoretical knowledge, classroom instruction, or student engagement. Second, to identify potential barriers to successful implementation of the constructivist perspective discussed in the PD session. And third, the mentors and mentees were asked to identify and discuss any instructional strategies that could alleviate or overcome the stated barriers to successful PBL implementation. For the purposes of this activity, mentors were provided with suggested successful strategies for removing the barriers for the discussion time. Finally, as a result of the data collected from the TSES- LF in the first session and analyzed by the researcher of the study, 10 individuals were selected for classroom observations based on their efficacy scores. As previously mentioned, the data collected from

the TSES- LF were analyzed by the researcher's dissertation committee chair as to eliminate potential bias that knowledge of the specific individuals could have on the classroom observations. After analysis by the dissertation chair, the names of the 10 individuals selected for observations were emailed, in random order, to the researcher. These individuals included five who scored the highest and five who scored the lowest on the scale but who was in each group remained unknown to the researcher. For the purposes of clarity within this discussion, individuals who scored the highest on the efficacy measure (which was revealed after all data were collected) are designated by pseudonyms that start with the letter H and individuals who were low scoring on the measure of their efficacy are identified by names that start with the letter L.

Session Two

Project Development and Project Management

In mid-December of 2018, 53 of the 55 teacher participants attended Session 2 of the professional development. Two individuals were not present for the session due to personal illness or the illness of a family member. The two participants who were not present were provided with a digital copy of the information power point presented and were provided an opportunity to discuss the session activities with the professional development leader. Both individuals scheduled and attended a make-up session in the following week. Teachers were again grouped according to their content areas. In order to review the topics from the previous session, a brief overview was presented and teachers were asked to discuss with their groups their understanding of the concepts from session one including the benefits of some of the PBL instructional strategies shared. During this review the researcher observed that teachers recalled information previously presented and applied the concepts to their current instructional context.

The researcher then presented information about the PD Course Plan including the instructional strategies to be presented in the session. During the presentation, teachers were asked to individually identify a subsequent unit of instruction that they could begin to plan a project based learning experience around. Each individual was asked to share their ideas with the group and were given time to brainstorm possible content units for this project. During this time, teachers were asked not only to consider the projects they might conduct in their classrooms, but also to also consider how they could connect across content areas, including elective courses, and create cross-curricular projects. Also, in the presentation, teachers were provided information about setting goals for project development, identifying the scope of the project, and creating the driving question for each project. Teachers were presented with information to support their understanding of the importance of the driving question in a PBL unit of study, how to create a driving question, and the benefits of revisiting the driving question throughout the project duration. Teachers focused on the primary goals of the project and how to engage students through the use of the driving question. During this portion of the session, participants were given three intervals of seven minutes to work independently and five minutes to share with their group. During the times when the group had discussions the researcher observed the conversations happening at each table and answered questions from the participants. Questions from the participants focused on how often the driving question should be revisited and whether or not students could assist in drafting the driving question. Researcher notes collected during the observations also indicated that participants were using the information presented in the session to draft their own driving questions. Observations from the researchers notes indicated that teachers were specifically using the template provided in the power point to create the driving questions. After sharing with the content area groups, teachers were asked to move tables and have a 10-minute discussion time with colleagues at the same grade level. This time was allotted to

allow teachers to observe other's content selections and make potential cross-curricular connections. In order to recognize high quality PBL instruction, the participants of the study watched a 15-minute video of a project based learning launch from research on Newsome Park High School. As a part of this activity, teachers were asked to identify 1) the scope of the project, which would indicate the amount of content being covered as well as the potential time frame for completion, 2) the instructional goals, which would be used to create the driving question and 3) the project's driving question from the observation of the video. Participants were asked to share these three elements within their group and discuss the positive activities in the video lesson and any potential areas that could have been improved. To conclude the session participants completed the Post Professional Development Feedback Survey. All surveys were analyzed and coded for impacts on the research questions; specifically, which components of the professional development were impactful in PBL strategy usage and which components influenced teacher efficacy.

The results of the survey indicated that the teachers who participated in session two found the information presented and the activities to be informative and helpful in continuing their development of effective PBL strategies.

In the weeks after Session 2, five of the ten teachers (labeled Group A) identified using the TSES-LF were selected for observation using the EQUIP measure. These teachers were identified by the researcher's dissertation committee chair in order to eliminate potential bias in observations. Also, mentors scheduled and completed session two using the previously mentioned discussion protocol. For mentors who were assigned multiple mentees, separate sessions were scheduled in order to give the less experienced teachers a one-on-one opportunity to discuss their practice. After the initial mentoring session, participants completed the Mentoring Function Scale measure. The data for these are shared later in the chapter.

Session Three

Assessing Student Learning in PBL

In mid January of 2019, 53 teachers were present for the third professional development session. The two individuals who were not present for the session were attending a state mandated Special Education training session. As a result, these participants were provided with digital copies of all activities completed in the session and given an opportunity to meet with the researcher to discuss the materials presented. Both individuals scheduled separately to discuss the previous session and all materials and information concerning the session was provided in a condensed format. Both individuals chose to watch the video at home and then a group session was held to discuss the elements the next day.

To begin the session the researcher asked that the teachers change their previous seating arrangements and sit according to grade level rather than content areas, electives teachers, who teach multiple grade levels, were then assigned to various groups in order to make equal groups. The initial activity of this session was to have teachers share how they were trying to implement new practices covered in previous sessions. As each group discussed aligning projects with instructional goals and creating a driving question. The researcher observed the conversations and made notes about the different topics mentioned. After the discussion time, the researcher gave a presentation about the elements of a successful PBL project launch, which was connected to their responses concerning the case study video in the previous session. At the conclusion of the project launch strategy presentation, teachers were asked to share with their groups any successful activities they previously used in the beginning of projects.

The next PBL strategy presented focused on the creation of formative assessments for measuring student understanding during the project. The information presented provided teachers with an opportunity to explore diagnostic, formative, and summative assessments

and how they are used within project based learning. The teachers were also given a 10-minute break out time to discuss how they use different types of assessments for determining student achievement during a PBL unit of study. After the discussion time, the professional development leader led an open discussion on the teacher activities that take place during the project including facilitation of student discourse. Following the presentation, teachers participated in the viewing of the Ferryway School classroom case study video. Prior to the video, participants were asked to identify and assess the level of effectiveness of 1) the assessments being used by the teacher and 2) any techniques or activities that they saw during the video that they thought would be helpful in engaging, monitoring, and redirecting student discussion. At the conclusion of the video, the participant groups shared their findings and discussed their current barriers and successes in the areas of assessment and facilitation of student discourse. Also, the groups were instructed by the researcher to discuss their plans for assessing the project idea that they had introduced in the previous session. At the conclusion of the three-hour session, teachers completed the PPDFS. Within two weeks after the session, the two teachers who were not in attendance met with the researcher individually to review the presentation and complete the activities.

In the weeks after Session 3, five more of the ten teachers identified for observation using the TSES-LF were observed using the EQUIP measure (Labeled Group B). Also, mentors scheduled and completed session three using the discussion protocol.

Session Four

Curriculum Management and Classroom Management

In early February of 2019, 55 teachers were present for the fourth professional development session. Seating arrangements were given for teachers according to grade level and electives teachers who teach multiple grade levels were assigned to a group. As in the previous sessions, the initial activity of this session was to participate in a discussion based

overview of the content from the previous session. During this discussion several teachers identified some concerns about the level of preparedness students had for the testing that would be occurring in late April and early May of the school year. Approximately 45 minutes was spent brainstorming possible strategies that could be implemented for preparing students for state mandated standardized testing, within the context of the PBL classroom, that would help to identify students who needed more support or remediation in certain areas. This discussion was used to inform the research question concerning teachers' feelings of efficacy concerning PBL practice. Discussions amongst small groups and the whole group were conducted on the ways that teachers can include more skills based activities during projects that would provide students with components needed for standardized testing. While this was not the intended topic for the session, the researcher allowed the discussion to continue and suggested that the mentoring session following the professional development session be focused on strategies for test preparation.

In the PBL strategy presentation portion of Session 4, the researcher gave a presentation on classroom management and project management strategies that are specific to the PBL classroom. After the presentation, teachers were asked to share within their groups what classroom management and curriculum management techniques they found to be successful in facilitating a positive classroom environment during PBL instruction. At the conclusion of the discussion, teachers were divided into two groups and asked to re-watch the Ferryway and Newsome Park case study videos again in order to observe the teachers with a focus on their classroom management techniques. Each group was asked to identify three positive classroom management techniques or teacher-student interactions observed and any areas of improvement of student management or classroom policies. Following the discussion and presentation, teachers completed the PPDFS.

In the weeks after Session 4, Group A (five teachers identified using the TSES-LF) were observed for a second time using the EQUIP measure. As previously mentioned, because of the dominance of teacher interest in the area of test preparation, the mentors were asked to schedule session four and focus their discussion on techniques used to prepare students for their end of course and other standardized assessments that would occur in the spring.

Session Five

Developing Literacy Tasks Within the Project

In late February of 2019, Session 5 occurred with 52 teachers in attendance. The three teachers not present for the session were absent due to a required statewide content area meeting. The participants who were not present were provided with a digital copy of the information presented and were given an opportunity to discuss the session activities with the professional development leader. All three individuals who did not attend Session 5 scheduled to meet with the researcher and all materials were provided during the condensed session. At the beginning of the session, teachers were asked to move back to their original seating arrangement based on content areas. As a review of the topics from the previous session a brief overview was presented and teachers were asked to discuss with their groups their understanding of the concepts from any of the previous sessions. During this review time the researcher observed and documented that participants recalled information presented and applied the concepts to their current instructional context. Prior to strategy instruction, the researcher asked for participants to share any beneficial information that had been discussed in the previous mentoring session regarding test preparation with their table groups for approximately 15 minutes. After the discussion time, the focus of the session turned to the incorporation of literacy tasks, including close reading, synthesis writing, analysis writing, and argumentative writing, and skills into their project design (across all disciplines)

as well as the development of project evaluation rubrics. This discussion again served to inform the research question concerning teacher efficacy. During the presentation, teachers were asked to individually identify how they were infusing literacy instruction within the project design that they were creating and intending to launch after the professional development course. Further, they were asked to consider what goals the literacy tasks were to accomplish. Each teacher in the group was asked to share and receive feedback on the literacy tasks that they had chosen to incorporate into their project design. During the discussion the researcher observed the conversations, recorded notes and observations, and answered questions concerning project development. Finally, the participants were given 15 minutes to design a rubric using the required school template that could be used to assess the project they were creating. At the conclusion of the time period, each individual was asked to share their rubric with their small group and were given time to receive feedback and create and carry out next steps for continued development. At the conclusion of the session, teachers were given an assignment for the following session. Each participant was asked to create a poster presentation of his or her full project that had been implemented for display in the final session of the professional development course. The participants were asked to focus their poster on the driving question, project launch activities, integration of literacy tasks, and assessments and rubrics created. Further, participants were asked to include illustrative student work samples completed by that point in the project. After answering questions concerning the logistics of the final session, participants completed the PPDFS (See Table 5.4). In the weeks after Session 5, Group B (the next listed five teachers identified using the TSES-LF) were observed for a second time using the EQUIP measure. Also, the teachers who were not in attendance for the fifth professional development session met with the researcher and received all materials and reviewed the activities of the session and asked to complete the PPDFS.

Session Six

Presentation of Developed Projects

In early March of 2019, 55 teachers were in attendance for the sixth, and final, session of the professional development course. Prior to the session, participants were asked to bring a poster that would display the content of the project they had created. Teachers were asked to specifically identify the content are being covered, the scope and sequence, the driving question, information on assessments, and any student work that had been completed. At the beginning of the session teachers were asked to complete the post-professional development TSES-LF and OHS-S survey measures. For the duration of the session, teachers were divided into three groups and given a 30-minute window to display their poster presentation of the project that they had created during the professional development course. The session included three rotations of presentations to ensure that all participants were able to display their work. While not presenting, participants rotated through the presentations and asked questions about the projects. Throughout the duration of the session, the researcher observed the presentations and made notes of the topics of discussion. At the conclusion of the session, the participants completed the PPDFS.

Data Analysis Framework

As previously discussed a mixed methods design was used collect qualitative and quantitative data (Shadish, Cook, & Campbell, 2002). Because of the lack of a control group, using this design provides a way for meaningful data to be collected without the presence of a comparison group. Shadish et al. (2002) further assert that for meaningful data to be collected in a mixed method design, assessment of participants should occur at intervals throughout the treatment, which further influenced the data analysis plan.

Quantitative Data

All quantitative data was collected via the various survey measures used to determine efficacy of teachers, perceptions of environmental support, and functions of the mentoring sessions. Further, the quantitative data collected provided the selective sampling (Newcomer, Hatry, & Wholey, 2010) that was used in order to determine 10 participants who were observed for qualitative data during the treatment.

Qualitative Data Analysis

The data collected via the Post Professional Development Feedback Survey (PPDFS) and the EQUIP (Marshall, et al., 2009) observation tool underwent multiple iterations of analysis in order to determine the themes and codes that occurred within the teachers' responses. The first analysis of the data included a holistic analysis that was used to understand the fidelity of implementation as well as initial observations from the participants. The second analysis was used to generate specific codes associated with the participant responses. The codes created focused on teacher participation in the professional development and the roles of teachers in the classroom. As a result, 16 codes were created and then merged into four themes that served data from the professional development participation and the classroom observation data. The codebook included the follow themes: (1) Strategies; (2) Questioning; (3) Support; and (4) Interactions (Table 5.1). On the third and final analysis of the data, inductive coding was carried out on the text from the PPDFS and the classroom observation researcher notes.

Table 5.1

PBL Teacher Thematic Codebook

Theme	Codes
Strategies	Content Instruction Project Scope Assessment

	Literacy Tasks/Activities
Questioning	Driving Question Discourse Management Discussion
Support	Curriculum Management Classroom Management Mentor Helpful Peer
Interactions	Feedback Positive Encouragement

Research Question Findings

The following section will present the quantitative and qualitative data, analysis and findings for each research question.

RQ1: Influence on PBL Strategies

Research question one focused on whether the teachers perceived that the professional development intervention changed teachers' implementation of PBL strategies in their classrooms. Researcher recorded field notes, indicated that teachers found the content in the sessions to be helpful in learning and implementing new strategies. Further, written responses on the Post Professional Development feedback survey provided insight as to how the teachers viewed the sessions. For example, Hallie (only pseudonyms were used), a first year PBL teacher, suggested,

> I found the research on the benefits of PBL to be particularly helpful in designing the projects that I present to my students. It helped me to understand why certain elements of PBL instruction are more engaging to students as they progress through projects.

Howard, an experienced PBL teacher stated,

> In looking at the barriers that I have had to success in my own classroom, I feel that I have many areas where I can grow as a PBL instructor. One of these being my clarity in explaining why we are using the PBL process and how beneficial it can be to my students.

Researcher notes from Session 2 further indicated that all groups were able to identify the scope and sequence of the project and could identify the primary instructional goals for implementing project based learning in the classroom. Teachers remarked about they learned about how to create clarity in their presentation of the scope of the project and how the teachers can now explain the sequence to students through the elements of the project that. However, three of the content areas groups found it difficult to identify the driving PBL questions. Lucy, a novice PBL teacher discussed

> "As a social studies teacher, it was difficult for me to identify the driving question from a content area [English example] that I am not very familiar with".

Data collected from the Post Professional Development Feedback Survey indicated that teachers felt the content presented during the PD sessions on writing and using driving questions to guide the PBL projects and developing the project scope was helpful in the development of their PBL skills (Table 5.2).

Table 5.2

Teachers' Perspectives on Whether the PD Content influenced Strategy Use, n = 53

	Disagree/ Strongly Disagree *n (%)*	Sometimes *n (%)*	Agree/ Strongly Agree *n (%)*
Driving Question	0 (0.0)	9 (16.9)	44 (83.0)
Project Scope	1 (1.8)	8 (15.0)	44 (83.0)

During session three, as the professional development content covered creating assessments different types of assessments, 94.3% (44 teachers) of the participants strongly agreed that the content on creating formative and summative assessments to determine if student understanding was impactful in their PBL strategy usage. Further, 88.6% (47 teachers) of the respondents indicated that they strongly agreed that the content of the professional development was impactful on their usage of PBL strategies (Table 5.3).

Table 5.3

Teacher's Perspectives on Whether the PD Content Influenced Strategy Use, n = 53

	Disagree/ Strongly Disagree *n (%)*	Sometimes *n (%)*	Agree/ Strongly Agree *n (%)*
Assessments	0 (0.0)	3 (5.6)	44 (94.3)
Discourse-Management	0 (0.0)	6 (11.3)	47 (88.6)

As the quantitative data collected indicates an influence of the PD content on strategy usage, the qualitative data collected from observations throughout the intervention also indicated an influence. Researcher notes collected during those observations revealed that ten of the ten observations that occurred throughout the study were coded for the theme of strategies and included the usage of strategies presented in the session on Driving Questions and project scope. It was also noted that eight of the ten teachers were coded for the theme of questioning as they were observed as having the Driving Question of their current project prominently displayed and referred students back to it during the lesson observed.

Data collected from the PPDFS at the completion of session four in the PD sequence focused on RQ1 and whether or not content focused on curriculum management and classroom management influenced PBL strategy usage. Classroom and curriculum management are categories that include such behaviors as managing student discussion, keeping students focused on tasks, keeping students focused on the area of content, which are key strategies in project based learning instruction. The data indicate that these were two

areas in which teachers did not feel as though the PD content was as helpful. As no specific data or quotations were collected from the attendees, it is unclear as to why five of the respondents disagreed/strongly disagreed with whether the PD content influenced their PBL strategy usage in the area of curriculum management and three of the respondents disagreed/strongly disagreed with whether or not the PD content influenced their classroom management. Possible hypotheses for this finding could consider that the teachers may have been feeling as though the session did not address their specific need or that they did not need as much support in these areas (Table 5.4).

Table 5.4

Teachers' Perspective on Whether the PD Content Influenced Strategy Usage, n = *55*

	Disagree/ Strongly Disagree *n (%)*	Sometimes *n (%)*	Agree/ Strongly Agree *n (%)*
Curriculum Management	5 (9.0)	4 (7.2)	46 (83.6)
Classroom Management	3 (5.4)	11 (20.0)	41 (74.5)

Researcher notes collected via the observations indicated that teachers again were influenced by the strategies discussed in the professional development session. Nine of ten teachers observed were coded in observations for the theme of support as using the best practices for curriculum management and classroom management that were delivered in the PD session.

From session five, which focused on literacy tasks, the data indicate that 47 of the 52 respondents found the session to influence their PBL strategy usage in this specific area of practice. Three respondents indicated that the session influenced their practice was sometimes and two disagreed that the session influenced their practice which could indicate that some of the teachers found the information to be redundant to prior knowledge or unrelated to their current situation or needs.

Table 5.5

Teachers' Perspectives on Whether the PD Content Influenced Strategy Usage, n = 52

	Disagree/ Strongly Disagree *n (%)*	Sometimes *n (%)*	Agree/ Strongly Agree *n (%)*
Literacy Tasks	2 (3.8)	3 (5.7)	47 (90.3)

0f the 20 observations that occurred, (10 teachers, observed for two separate periods) 20 of 20 observations were coded on the theme of strategies for their usage of literacy tasks and assessments. Further, these teachers were also coded for the theme of interactions as they consistently provided students with feedback (whether verbal or written) concerning the classroom activities.

As session six allowed teachers to display their final projects and receive feedback on their project ideas, 96% of the teachers indicated via the PPDFS that they agreed or strongly agreed session was impactful on strategy usage (Table 5.6).

Table 5.6

Teachers' Perspective on Whether the PD Content Influenced Strategy Usage, n = 55

	Disagree/ Strongly Disagree *n (%)*	Sometimes *n (%)*	Agree/ Strongly Agree *n (%)*
Peer Project Observation	0 (0.0)	2 (3.6)	53 (96.3)

Feedback collected by the PPDFS after the Peer Project Observation session indicated that the session had supported teachers in many areas. 52 of the 55 responses were coded on the themes of support, strategies and interactions. The researcher captured two teachers' responses that were related to these findings. Leah said about the teachers' final PBL project showcase,

> Being able to see the full scope of another teacher's project and being able to ask questions about how they chose to design the student activities throughout gave me

some good perspective for creating my own projects and some ideas that I will implement in my own practice in the future.

Hallie, stated,

> Observing projects from other content areas was encouraging to me; I realized that other teachers on the same grade level are holding my students to a high level of rigor that I can push towards as well.

The EQUIP Measure

Marshall, et al.'s (2010) EQUIP measure provided one measure to explore these changes as an observation instrument to evaluate the implementation of PBL strategies for ten of the 55 participants. The instrument uses the subscales of instructional factors, discourse factors, assessment factors, and curriculum factors. Each subscale on the measure received a score ranging from one to four; these scores were then averaged to calculate the teachers' total overall mean scores. In the first classroom observations, overall mean scores ranged from 1.00 (pre-inquiry level) to 4.00 (exemplary inquiry level). In the second classroom observations, mean scores ranged from 1.75 to 4.00 for the teachers observed (See Table 5.7 and 5.8 for descriptive statistics).

Table 5.7

Group A, Descriptive Statistics for Observation Scores - EQUIP

Teacher Pseudonym	Observation 1 (n=5)	Observation 2 (n=5)
Helen	3.5	3.0
Hank	3.3	3.5
Hannah	4.0	4.0
Lanie	1.0	2.5
Hollie	3.0	3.3

Table 5.8

Group B, Descriptive Statistics for Observation Scores - EQUIP

Teacher Pseudonym	Observation 1 (n=5)	Observation 2 (n=5)
Layla	1.75	2.75
Leah	2.00	2.75
Leslie	1.75	3.00
Hallie	1.25	2.50
Howard	3.75	3.75

Using a paired sample *t test*, Marshall et al.'s (2010) EQUIP observational measure indicates a significant difference between the pre and post observations indicating an increase in the participants' mean score on the instructional factors subscale. This result indicates that on average there was an increase of teachers' use of inquiry-based strategies in the classroom. Leah commented in a response on the PPDFS concerning the EQUIP's domain on instructional factors, which focus on active student learning, depth of understanding, and student investigation which all related to RQ1,

> Prior to our session, I had never given much concern to how the Driving Question pushes students towards creating their own understanding and investigating what they know and what they need to learn in order to accomplish a task.

Another teacher, Howard, discussed the benefit of pushing students toward active learning via the application of concepts to solve a problem,

> My students are so much more creative when I give them an open-ended problem to solve using the skills they have previously acquired; they come with new ideas that even I had never considered.

Concerning the discourse factors as defined by the EQUIP measure, which focus on student engagement factors, Hank commented,

> With implementing new literacy tasks into my project design I have been able to push my students toward explaining and justifying their decisions in writing, which I feel is an amazing real world skill that will help them in the future.

The assessment factor was mentioned in 51 of 55 (93%) PPDFS responses., a first year PBL teacher, wrote,

> I had no idea how to adequately and effectively assess my students in the PBL setting. I am glad I got to sit down with my mentor and discuss how to gather effective data through assessment.

Leslie, another novice PBL teacher wrote concerning the curriculum factors,

> This PD has helped me recognize how much ground I should be covering and which concepts I should be focusing more heavily on.

Given the increases in scores between the first and second observations it is difficult to discern whether the professional development course is the reason scores increased or whether teachers may have improved over time simply to increased practice in using PBL instructional strategies or their coaching sessions. However, the qualitative data indicate that the PBL focused professional development was beneficial to teachers in increasing the implementation of PBL strategies in their classrooms.

Classroom Observations

Notes taken by the researcher during the classroom observations were reviewed in conjunction with the EQUIP observation measure. Observations consisted of observing a 55-minute class period. At the arrival of the researcher to each classroom behaviors such as teachers interacting with colleagues or conversations with students were noted. The researcher notes collected indicated that teachers with higher levels of efficacy had more interactions of a positive nature with their peers and their students in the time prior to beginning of instruction. Of the five high efficacy teachers observed, all five displayed an

interaction of positive nature with either a peer or multiple students during the observations. These were noted as behaviors such as providing feedback or encouragement to peers, and providing feedback or encouragement to students. The researcher noted the artifacts used in the classroom to guide students in the research of their given project topic, and the types of content materials provided to students. It was noted that teachers with more experience utilized artifacts directly related to the content from the professional development sessions. These artifacts included posters of the driving question and the key content ideas being focused on for the project duration. In each observation, the researcher recorded notes concerning the activities of the teacher. These activities included: the agenda of the class period, the activities used, the types of assessments used, feedback provided to students, and the classroom management occurring. Notes were also taken concerning the student activities in the classroom. These notes focused on student engagement, student interaction with the content, and student discourse. Observation notes indicated that teachers who struggled with maintaining a high level of student engagement were also teachers with lower efficacy scores. In four of the five low efficacy classrooms observed, it was noted by the researcher that classroom management was something that disrupted the instruction occurring. Student behaviors including talking out, aimlessly moving around in the room, and repeatedly being off task were all noted in these classroom. A consideration for the cause of this could be that teachers who do not feel successful at their content delivery are not likely delivery engaging content. Or, that teachers with low efficacy are so concerned with their content delivery may be so self-focused that they may overlook disengaged students. During the lesson, notes were taken as the researcher tried to understand the goals of the lesson and how it fit into the structure of the project being presented. All teachers were observed two times during the course of the professional development course.

Differences between the teachers were observed by the researcher and noted throughout the classroom visits. Behaviors that were noted included classroom management abilities, clarity in project design, clarity in content instruction, ability to manage student discourse, and transitions between classroom activities. Upon reflection of the efficacy scores after observations, teachers who indicated higher levels of efficacy showed more effective PBL instruction. These teachers managed student discourse effectively and redirected students who were not on task more effectively. Finally, the rigor of project design appeared higher in these classrooms. The classrooms in which a lower level of classroom management was evident were found to be those of teachers who indicated lower levels of efficacy. Research question two addressed the impact of the program on teacher efficacy.

RQ2: Impact on Teacher Efficacy

Research question two focused on the participants' levels of efficacy related to usage of PBL strategies. Using the tool created by Tschannen-Moran and Woolfolk Hoy (2001) levels of efficacy were collected prior to the professional development course and after the course. As previously stated, the 24-item measure asks teachers to rate their ability on tasks having to do with their practice on a Likert scale of one to nine. While the measure uses three subscales: efficacy for instructional strategies, efficacy for classroom management, and efficacy for student engagement, overall means scores were used to group the individuals for the purposes of observation. The researcher compared pre- and post intervention TSES-LF scores (See Table 5.8 and Appendix N). A paired sample *t test* revealed a statistically significant difference t(55) = 4.992, p = 0.0001 between the total pre-intervention TSES-LF score (M = 6.93, SD = 1.009), confidence interval [0.0833, 0.6167]and the total post-intervention TSES-LF score (M = 7.28, SD = 0.808), confidence interval [0.0833, 0.6167]. The Cohen's effect size value (d= 0.000061) was found to be small. In the pre-PD data collection, mean scores of teacher sense of efficacy ranged from 5.10 to 9.0. In the post-PD

collection, mean scores ranged from 5.83 to 9.0. (See Table 5.9 for descriptive statistics, the full data set can be found in Appendix I).

Table 5.9

Descriptive Statistics for Efficacy Scores - TSES-LF

Teacher Pseudonym	Pre-PD (*n*=55)	Post-PD (*n*=55)
Helen	8.63	8.63
Hank	8.13	8.63
Hannah	8.25	8.25
Jamie	5.10	6.92
Hollie	8.08	8.25
Layla	5.29	6.54
Leah	5.29	6.50
Leslie	5.29	6.30
Hallie	5.38	6.30
Howard	9.00	9.00

Qualitative data collected via the PPDFS indicated that 54 of 55 participants (98%) indicated that they felt the professional development had helped them further develop their PBL skills and improve their classroom practice. Areas of noted positive as discussed previously focus were improvement in project design and connection to course standards, overall project assessment and the development of improved summative assessments, improved rubric design, increased abilities in facilitating positive discussion, improved classroom management techniques, and fostering student creativity through project design. Hallie, a novice PBL teacher indicated,

> My level of PBL understanding has been positively impacted as a result of this PD, I feel more equipped to create projects, to work cross-curricularly (sic) with my colleagues, and to manage my students' behavior in the classroom during projects.

Hollie, an experienced PBL teacher wrote,

> Although I have been practicing PBL for a few years, this PD helped refresh my skill set and gave me a chance to consider some positive changes for how I direct student

conversations in my classroom. I feel as though I will be able to manage the discussions that occur more effectively.

Finally, Hank discussed his improvement in creating effective assessments saying,

> I feel like I can better gauge my students' understanding of topics by creating more efficient and effective project assessments that track student learning throughout the duration of the project as well as the assessments of the entire project.

Findings from the PPDFS indicate that as PBL teachers participate in professional development specific to the PBL context, feelings of efficacy associated with their practice increase.

Perceptions of School Environmental Support

Research question three focused on the participants' perceptions of the school environmental support. This includes an emphasis on academics, collegial leadership, integrity of the institution, resource influence and teacher affiliation (Tschannen-Moran & Hoy, 2001). Using the Organizational Health Index-Secondary (OHI-S) (Tschannen-Moran & Hoy, 2001) as a pre- and post- professional development measure is used to determine aspects of the health of a school. The measure of indicates that a healthy school meets the functional needs and seeks to directly engage teachers in the mission and purpose of the school (Table 5.10).

Table 5.10

Range Descriptors of Organizational Health Index - OHI-S

Health Category	Minimum Score	Maximum Score
Very Low	< 400	400
Low	400	449
Below Average	450	475
Slightly Below Average	476	489
Average	490	510
Slightly Above Average	511	524
Above Average	525	550
High	551	599

Very High	600	>600

The pre professional development Health Index Score generated by the 55 respondents (n=55) yielded a mean score of 531.41 (SD = 1.009) which indicates an above average level of school health, which are listed below (Table 5.11, the full data set can be found in Appendix J).

Table 5.11

Descriptive Statistics for the Organizational Health Index - OHI-S

Teacher Pseudonym	Pre-PD (*n*=55)	Post-PD (*n*=55)
Helen	533	558
Hank	545	563
Hannah	584	579
Jamie	585	574
Holli	513	511
Lanie	493	526
Leah	546	513
Leslie	601	605
Hallie	503	561
Howard	560	549

The post-professional development Health Index mean score was 548.21 (SD = 0.808), which also falls into the above average range according to the measure. A paired sample *t test* revealed a statistically significant difference t(55) = 3.5087, p = 0.0009 between pre-intervention OHI-S score (M = 531.42, SD = 30.12) and the post-intervention OHI-S score (M = 548.22, SD = 29.97), a confidence interval [8.6198, 24.5402]. The Cohen's effect size value (d= 0.657431) was found to be moderate. The mean scores collected and analyzed on the index indicate that morale; resource support, consideration, academic emphasis, institutional integrity, principal influence, and initiating structure are all above average per the OHI-S analysis descriptors (Table 5.10).

Further, the Mentoring Function Scale (MFS) (Noe, 1988) data, which was collected from the 21 novice teachers in the intervention, were analyzed using a paired *t test* which

revealed a statistical significance, t (21) = 21.726, p = 0.0001. The data collected post session one (M = *2.9933, SD* = 0.5966) indicated that levels of support were moderate, as defined by the measure. The data collected post session four (M = 4.0740*, SD* = 0.4980) indicated high levels of mentoring support (See Table 5.12).

Table 5.12

Means for Survey Items Grouped by Subscales for Novice Teachers post PD Session 1

Function/Item Number Descriptor	Novice Teachers Post Session 1 M (n=21)	Novice Teachers Post Session 4 M (n=21)
Coaching (Career)		
Item 1/Shared History	3.06	4.18
Item 2/Prof. Growth	3.22	4.42
Item 3/Career Goals	3.16	4.30
Item 4/Shared Ideas	3.50	4.58
Item 5/Teaching Objective	3.46	4.32
Item 6/Feedback	3.36	4.48
Acceptance/Confirmation		
Item 7/New Methods	2.96	4.16
Item 8/Respect	3.66	4.82
Item 9/Suggestions	2.32	3.46
Role Model (Psychosocial)		
Item 10/Imitate Style	2.06	3.20
Item 11/Modeled Values	3.26	4.18

Table 5.4 (continued)

Function/Item Number Descriptor	Novice Teachers Post Session 1 M (n=21)	Novice Teachers Post Session 4 M (n=21)
Item 12/Respect	3.50	4.70
Item 13/Expertise	3.10	4.36
Counseling (Psychosocial)		
Item 14/Listening	3.54	4.76
Item 15/Competence	3.48	4.70
Item 16/Conflicts	3.38	4.08
Item 17/Experiences	4.18	4.14
Item 18/Verbalize Fears	3.04	3.86
Item 19/Empathy	3.58	4.54
Item20/Confidence	3.60	4.62
Protection (Career)		
Item 21/Help Problems	2.66	3.50
Item 22/Complete Deadlines	2.84	3.98
Exposure/Visibility (Career)		
Item 23/Meet Colleagues	2.58	3.82
Item 24/Written Contact	2.00	3.26

Item 25/ District Contact Sponsorship (Career)	1.88	3.42
Item 26/Tasks for Growth Assignments (Career)	2.14	3.44
Item 27/New Skills	2.32	3.66
Item 28/Critical Feedback Friendship (Psy.)	3.30	4.34
Item 29/At work	2.44	3.62
Item 30/Outside of Work	2.22	3.32

The scores were collected after the first mentoring session in order to determine the baseline for which teachers felt supported through the mentoring relationship. The second data collection occurred after the fourth session, which was after the final mentoring session. Hallie, a first year teacher indicated in her PPDFS response,

> Being paired with my mentor has been the biggest help this year. Knowing that I have someone to bounce ideas off of and ask questions without feeling embarrassed has really benefited my classroom practice!

Leah also indicated benefits of the mentoring sessions when she discussed the following in her PPDFS reflection,

> My mentoring sessions, though not nearly long enough, have really helped to give me perspective concerning where I should be pushing my kids further. It has been great to hear from other experienced teachers on a regular basis.

While both the OHI-S (Tschannen-Moran & Hoy, 2001) and MFS (Noe, 1988) show higher post professional development overall mean scores in the Health Index Score, because the Abraham School district has never previously implemented professional development of this type it is difficult to say whether or not the professional development and mentoring alone are reasons that teachers feel greater levels of organizational support. However, professional development and mentoring that are focused on PBL strategy development may play a role in increasing perceptions of organizational support, which plays a role in teacher retention.

Fidelity of Implementation: A Summary

For fidelity of implementation to be met, the intervention must align with the design of the program, participants must be in attendance for the sessions or be given the opportunity to revisit any session materials missed, and any differentiation from the program design must be identified. In response to Evaluation Question 1 (EQ1) the professional development program was presented as designed in terms of content and activities conducted in each session. In response to EQ2, each participant, whether present for the session or given the opportunity to receive the content after the session, was able to view the presentation information and accessed other activities presented (Table 5.13).

Table 5.13 *Professional Development - Participant Attendance*

Session Number	Participant Attendance (*n-=55)*
Session One	55 (100%)
Session Two	53 (96.4%)
Session Three	53 (96.4%)
Session Four	55 (100%)
Session Five	52 (95.0%)
Session Six`	55 (100%)

In the study there was no participant attrition from the professional development program or mentoring sessions. During three sessions, (sessions two, three, and five) some individuals were not present due to personal illness or other required school related commitments. These participants were provided with a video recording of the instructional portion of the sessions and provided copies of the corresponding materials that were used in the session. All individuals who were not present during a session were encouraged to discuss the information presented with their mentor or to discuss the information with the researcher. Follow up on whether or not these discussions took place was recorded and is considered as a limitation of the research. All participants who had been absent during a professional development session met with the researcher to review the material missed. In response to

EQ3, all session materials adhered to the design of the session topics and were conducted within the time constraints of the design. The only exception the design was the inclusion of session time spent on discussing end of year assessments in Session Four.

Discussion

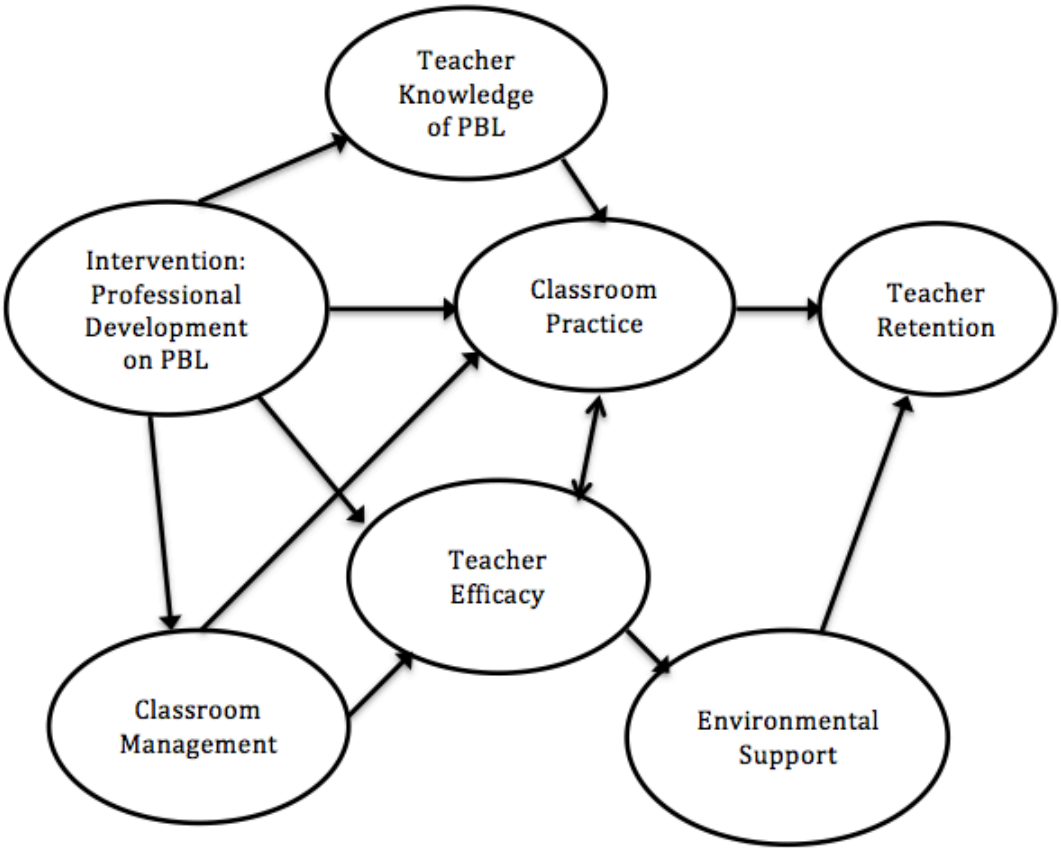
This research study examined the impacts of targeted professional development and mentoring for 55 teachers. While statistical significance was found in the areas of efficacy, perceptions of environmental support, and perceptions of support through mentoring (in novice teachers) it is unclear as to whether or not the ultimate outcome of teacher retention was impacted. Also, both quantitative and qualitative data collected throughout the study indicate that participation in the professional development and mentoring positively influenced teacher project based learning practice**.** The research conducted as a part of this study can provide existing research in the field of education and may have new insights in conducting professional development for PBL teachers. As teachers participated in embedded professional development that was focused directly on their practice, a significant impact on efficacy and perceptions of environmental support were found. As this research study and literature indicate, teachers desire professional development and environmental support (mentoring) that can help them to continue to refine their PBL implementation skills. The study further indicates that experience plays a role in the development of rigorous projects and feelings of efficacy concerning practice**.** It is difficult to determine the impact that these things will ultimately have on the retention of teachers moving forward**.**

Recommendations for Future Research

This study brings to light some potential opportunities for extended research. First, a focus on the specific characteristics of teacher efficacy could be an extended avenue of research that could also shape future professional development offerings. Based on the data

collected through evaluating the need of teachers via the TSES-LF, their descriptions of the levels of importance in the areas of classroom management, instructional strategies, and student engagement, which are all subscales on the measure, could be determined as areas for further exploration. Second, in using Marshall et al.'s (2010) EQUIP measure; it may be beneficial to build in time in the PD prior to observations, that provide an opportunity to discuss the measure and the components that evaluate the teacher, so that teachers would have a clear understanding of the expectations that they were held to for instruction. This need was identified through the questions that were expressed during the discussion time held during each session and collected in the researcher's field notes. Teachers expressed that being able to see the elements that the measure explores would be helpful in emphasizing certain aspects of instruction. Further, post-observation opportunities to discuss the evaluation should also be included to further improve teacher practice in the factor areas assessed. Teachers also expressed that they would have liked to have a reflection session after the observations in order to review their own practice and discuss areas of improvement in their instruction. Reflection and review of instructional practices could continue to help teachers identify areas of weakness. Finally, as reported in the PPDFS, due to the broad content areas represented in the sample of this study and the requirement to keep a broad perspective in the learning sessions, a replication of the professional development with each content area could be beneficial and further display how teacher practice could be shaped in each of the specific content areas.

Figure 5.1 *Reexamining the Conceptual Framework*



The conceptual framework for this study centered around the ways that teacher professional development could influence teachers' ability to implement positively and positively influence their ability to manage a PBL classroom. Based on the literature that school environment and teacher attrition are correlated (Hebert & Worthy, 2001; Johnson & Birkeland, 2003; and Kelley, 2004) the district initiated intervention was designed to support teachers in their PBL practice in the hopes that positive perceptions of support would increase. Further, the literature indicates that higher self-reports of efficacy are correlated with persistence and resilience in a teacher's practice (Pajares, 1996). The design of this conceptual framework was effective, however, greater emphasis being placed on classroom management and curriculum instruction in the professional development may have improved the outcomes, which are discussed in the limitations.

Limitations

In this study there were several limitations that should be understood in order to fully interpret the research findings. First, due to the context in which the study took place, there was no control group to compare the results against. All teachers in the context were participants in the required professional development and mentoring protocol except for the researcher. Second, the context in which the study takes place is a fully immersed PBL environment. The school's characteristics, including the educational environment, course structure, and instructional strategies may limit the application of the findings to schools with different contexts. As many schools are not solely dedicated to implementing a project based learning environment, some data collected in this setting may not be applicable to other schools. Teachers who apply to a school with this kind of program may have a different inclination towards PBL implementation than those in this study. Further, because the school is located in a rural area, the findings may not be applicable to urban or suburban areas. In considering the professional development that took place, the duration of the study may have played a role in the outcome of the study. A more consistent course of study with less time between sessions may be more beneficial for application of PBL skills. Further, a greater emphasis on classroom management and curriculum instruction topics within the PD sessions may have resulted in more positive outcomes.

Summary

This research indicates that the factors that increase effective PBL strategy use, increased efficacy related to perceptions of instructional effectiveness (Hughes, 2012; Smith & Ingersoll, 2004), and increased perceptions of environmental support within and among school level faculty (Garet, Porter, Desimone, Birman, & Yoon, 2001) may have an impact on decreasing attrition of PBL teachers. Further, PBL teachers can benefit from professional

development that is focused on the project based learning environment (Garet, Porter, Desimone, Birman, & Yoon, 2001). If PBL schools wish to support teachers, this study suggests that professional development be aimed at the specific skills required by PBL teachers on daily basis. Further, any professional development should give them opportunities to discuss barriers to implementation, strategies for effective implementation, and opportunities to observe and evaluate the practice of effective veteran teachers.

References

Adnot, M., Dee, T., Katz, V., & Wyckoff, J. (2017). Teacher turnover, teacher quality, and student achievement in DCPS. *Educational Evaluation and Policy Analysis*, *39*(1), 54-76. doi:10.3102/0162373716663646

Alacapınar, F. (2008). Effectiveness of project-based learning. *Eurasian Journal of Educational Research (EJER), 33*, pp.17-34. doi:10.14689/ejer.2018.75.11

Allensworth, E., Ponisciak, S., & Mazzeo, C. (2009). The schools teachers' leave: Teacher mobility in Chicago Public Schools. *UChicago: Consortium on School Research.* Retrieved from http://ccsr.uchicago.edu/publications/CCSR_Teacher_Mobility.pdf

Andrews, B. D., & Quinn, R. J. (2005). The effects of mentoring on first-year teachers' perceptions of support received. *The Clearing House: A Journal of Educational Strategies, Issues and Ideas, 78*(3), 110-117. doi:10.3200/TCHS.78.3.110-117

Anthony, G., Kane, R. G., Bell, B., Butler, P., Davey, R., Fontaine, S., & Naidoo, K. (2008). *Making a difference: The role of initial teacher education and induction in the preparation of secondary teachers.* Teaching and Learning Research Initiative Wellington, NZ. Retrieved from http://www.tlri.org.nz/sites/default/files/projects/9217_finalreport.pdf

Ball, D. L., & Cohen, D. K. (1999). Developing practice, developing practitioners: Toward a practice-based theory of professional education. *Teaching as the Learning Profession: Handbook of Policy and Practice, 1*, 3-22. Retrieved from http://www-personal.umich.edu/~dkcohen/downloads/developingpractice.pdf

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191-215. doi:10.1037/0033-295X.84.2.191

Bandura, A. (1982). Self-efficacy mechanism in human agency. *American Psychologist*, *37*(2), 122-147. doi:10.1037/0003-066X.37.2.122

Barrera, A., Braley, R. T., & Slate, J. R. (2010). Beginning teacher success: An investigation into the feedback from mentors of formal mentoring programs. *Mentoring & Tutoring: Partnership in Learning, 18*(1), 61-74. doi:10.1080/13611260903448383

Becker, H. J., & Riel, M. (1999). Teacher professionalism and the emergence of constructivist-compatible pedagogies. Irvine: University of California, Irvine, Center for Research on Information Technology and Organizations. Retrieved September, 9, 2010 from http://www.crito.uci.edu/tlc/findings/special_report2/start-page.htm.

Bell, S. (2010). Project-based learning for the 21st century: Skills for the future. *The Clearing House, 83*(2), 39-43. doi:10.1080/00098650903505415

Bey, T. M., & Holmes, C.T. (Eds.) (1990). *Mentoring: Developing successful new teachers.* Reston, VA: Association of Teacher Educators.

Birenbaum, M. (2003). New insights into learning and teaching and their implications for assessment. In *Optimising new modes of assessment: In search of qualities and standards* (pp 13-36). Springer, Dordrecht. doi: 10.1007/0-306-48125-1_2

Blank, R. K., de las Alas, N., & Smith, C. (2008). Does teacher professional development have effects on teaching and learning? Analysis of evaluation findings from programs for mathematics and science teachers in 14 states. Washington, D.C., Council of Chief State School Officers.

Blumenfeld, P. C., Soloway, E., Marx, R. W., Krajcik, J. S., Guzdial, M., & Palincsar, A. (1991). Motivating project-based learning: Sustaining the doing, supporting the learning. *Educational Psychologist, 26*, 369-398. doi:10.1080/00461520.1991.9653139

Boaler, J. (2000). Exploring situated insights into research and learning. *Journal for Research in Mathematics Education, 31*(1), 113- 119. doi:10.2307/749822

Bobek, B. L. (2002). Teacher resiliency: A key to career longevity. *The Clearing House, 75*(4), 202-205. doi:10.1080/00098650209604932

Boote, D. N., & Beile, P. (2005). Scholars before researchers: On the centrality of the dissertation literature review in research preparation. *Educational Researcher, 34*(6), 3-15. doi:10.3102/0013189X034006003

Borko, H. (2004). Professional development and teacher learning: Mapping the terrain. *Educational Researcher, 33*(8), 3-15. doi:10.3102/0013189X033008003

Bound, E. L. O. (1999). A design for comprehensive school reform. *Cambridge, MA: Expeditionary Learning Outward Bound,*

Boyd, D., Grossman, P., Ing, M., Lankford, H., Loeb, S., & Wyckoff, J. (2011). The influence of school administrators on teacher retention decisions. *American Educational Research Journal, 48*, 303-333. doi:10.3102/0002831210380788

Boyd, D., Grossman, P., Lankford, H., Loeb, S., & Wyckoff, J. (2006). How changes in entry requirements alter the teacher workforce and affect student achievement. *Education and Policy, 1*(2), 176-216. Retrieved from https://aefpweb.org/journal/

Boyle, B., Lamprianou, I., & Boyle, T. (2005). A longitudinal study of teacher change: What makes professional development effective? Report of the second year of the study. *School Effectiveness and School Improvement, 16*(1), 1-27. doi:10.1080/09243450500114819

Bryk, A., & Schneider, S. (2002). *Trust in schools: A core resource for improvement*. New York: Russell Sage Foundation.

Buchanan, J., Prescott, A., Schuck, S., Aubusson, P., Burke, P., & Louviere, J., (2013) Teacher retention and attrition: Views of early career teachers. *Australian Journal of Teacher Education 38*(3). doi:10.14221/ajte.2013v38n3.9

Carter, K. (2004). Online training: What's really working? What does today's successful online professional development look like? *Technology & Learning, 24*(10), 32.

Clark, M. C., & Caffarella, R. S. (1999). Theorizing adult development. *New Directions for Adult and Continuing Education*, *84*, 3-8.

Clark, V. P., & Creswell, J. W. (2011). *Designing and conducting mixed methods research*. Los Angeles, CA: Sage.

Cruickshank, D. R., Kennedy, J. J., & Myers, B. (1974). Perceived problems of secondary school teachers. *The Journal of Educational Research, 68*(4), 154-159. Retrieved from https://tntp.org/publications

Darling-Hammond, L. (1997). *Doing what matters most: Investing in quality teaching*. National Commission on Teaching & America's Future, Kutztown Distribution Center, 15076 Kutztown Road, PO box 326, Kutztown, PA 19530-0326. 1997.

Darling-Hammond, L. (2003). Keeping good teachers: Why it matters, what leaders can do. *Educational Leadership, 60*(8), 6-13. Retrieved from http://www.ascd.org/publications/educational-leadership

Darling-Hammond, L. (2006). Constructing 21st-century teacher education. *Journal of Teacher Education, 57*(3), 300-314. doi:10.1177/0022487105285962

Darling-Hammond, L., & Bransford, J. (2007). *Preparing teachers for a changing world: What teachers should learn and be able to do.* John Wiley & Sons.

Darling-Hammond, L., Chung, R., & Frelow, F. (2002). Variation in teacher preparation how well do different pathways prepare teachers to teach? *Journal of Teacher Education, 53*(4), 286-302. doi:10.1177/0022487102053004002

Darling-Hammond, L., Wei, R. C., Andree, A., Richardson, N., & Orphanos, S. (2009). Professional learning in the learning profession. *Washington, DC: National Staff Development Council*, *12*.

Darling-Hammond, L., Holtzman, D. J., Gatlin, S. J., & Heilig, J. V. (2005). Does teacher preparation matter? Evidence about teacher certification, teach for America, and teacher effectiveness. *Education Policy Analysis Archives, 13*(42). doi:10.14507/epaa.v13n42.2005

Darling-Hammond, L., & McLaughlin, M. W. (1995). Policies that support professional development in an era of reform. *Phi Delta Kappan*, *76*(8), 597-604. Retrieved from kappanmagazine.org

Denmark, V., & Podsen, I. (2000). The mettle of a mentor. teachers who mentor others need to explore seven competencies. *Journal of Staff Development, 21*(4), 18-22.

DeMonte, J. (2013). *High-quality professional development for teachers: Supporting teacher training to improve student learning*. Center for American Progress. Retrieved from https://cdn.americanprogress.org/wp-content/uploads/2013/07/DeMonteLearning4Teachers-1.pdf

Desimone, L. M., Smith, T, Baker, D., & Ueno, K. (2005). Assessing barriers to the reform of United States mathematics instruction from an international perspective. *American Educational Research Journal*, 42(3), 501-535. doi:10.3102/00028312042003501

Desimone, L. M., Smith, T., & Frisvold, D. (2007). Is NCLB increasing teacher quality for students in poverty? In Gamoran, A. (Ed.), *Standards-based and the poverty gap: Lessons from No Child Left Behind* (pp. 89-119). Washington, DC: Brookings Institution Press.

Desimone, L. M., Smith, T. M., Hayes, S., & Frisvold, D. (2005). Beyond accountability and average math scores: Relating multiple state education policy attributes to changes in student achievement in procedural knowledge, conceptual understanding and problem solving in mathematics. *Educational Measurement: Issues and Practice*, *24*(A), 5-18. doi:10.1111/j.1745-3992.2005.00019.x

Dicke, T., Elling, J., Schmeck, A., & Leutner, D. (2015). Reducing reality shock: The effect of classroom management skills training on beginning teachers. *Teaching and Teacher Education*, *48*, 1-12. doi: 10.1016/j.tate.2015.01.013

Dixon, F. A., Yssel, N., McConnell, J. M., & Hardin, T. (2014). Differentiated instruction, professional development, and teacher efficacy. *Journal for the Education of the Gifted*, *37*(2), 111-127. doi:10.11770/0162353214529042

Dusenbury, L., Brannigan, R., Falco, M., & Hansen, W. B. (2003). A review of research on fidelity of implementation: Implications for drug abuse prevention in school settings. *Health Education Research, 18*(2), 237-256. doi:10.1093/her/18.2.237

Elmore, R. F., & Burney, D. (1997). *Investing in teacher learning: Staff development and instructional improvement in community school district# 2, New York City.* Pittsburgh, PA: High Performance Learning Communities Project. Learning Research and Development Center, University of Pittsburgh.

English, M. C., & Kitsantas, A. (2013). Supporting student self-regulated learning in problem-and project-based learning. *Interdisciplinary Journal of Problem Based Learning*, *7*(2), 6. doi:10.7771/1541-5015.1339

Ertmer, P. A., & Newby, T. J. (1993). Behaviorism, cognitivism, constructivism: Comparing critical features from an instructional design perspective. *Performance Improvement Quarterly, 6*(4), 50-72. doi:10.1111/j.1937-8327.1993.tb00605.x

Ewing, R., & Smith, D., (2003). Retaining quality early career teachers in the profession. *English Teaching Practice and Critique, 2*(1), 15-32.

Expeditionary Learning Outward Bound (1999). *Early indicators from schools implementing New American Schools Designs*. Cambridge, MA: Expeditionary Learning Outward Bound.

Fantilli, R. D., & McDougall, D. E. (2009). A study of novice teachers: Challenges and supports in the first years. *Teaching and Teacher Education, 25*(6), 814-825. doi: 10.1016/j.tate.2009.02.021

Fernet, C., Guay, F., Senécal, C., & Austin, S. (2012). Predicting intraindividual changes in teacher burnout: The role of perceived school environment and motivational factors. *Teaching and Teacher Education*, *28*(4), 514-525. doi:10.1016/j.tate.2011.11.013

Fetherston, T., & Lummis, G. (2012). Why Western Australian secondary teachers resign. *Australian Journal of Teacher Education*, *37*(4), 1. doi:10.14221/ajte.2012v37n4.1

Feuer, M. J., Floden, R. E., Chudowsky, N., & Ahn, J. (2013).*Evaluation of Teacher Preparation Programs: Purposes, Methods, and Policy Options*. Washington, DC: National Academy of Education.

French, V. W. (1997). Teachers must be learners, too: Professional development and national teaching standards. *NASSP Bulletin*, *81*(585), 38-44. doi:10.1177/019263659708158507

Fuller, E. (2003). Beginning teacher retention rates for TxBESS and non-TxBESS teachers. *Unpublished Paper. State Board for Educator Certification, Texas,*

Gallagher, S. A., & Stepien, W. J. (1996). Content acquisition in problem-based learning: Depth versus breadth in American studies. *Journal for the Education of the Gifted, 19*(3), 257-275. doi:10.1177/016235329601900302

Ganser, T. (1999). Under their wing: Promises and pitfalls of mentoring. *High School Magazine, 7*(2), 8-13.

Gardner, R. D. (2010). Should I stay or should I go? Factors that influence the retention, turnover, and attrition of K–12 music teachers in the United States. *Arts Education Policy Review, 111*(3), 112-121. doi:10.1080/10632910903458896

Garet, M. S., Porter, A. C., Desimone, L., Birman, B. F., & Yoon, K. S. (2001). What makes professional development effective? Results from a national sample of teachers. *American Educational Research Journal, 38*(4), 915-945. doi:10.3102/00028312038004915

Gehrke, N. J., & Kay, R. S. (1984). The socialization of beginning teachers through mentor-protégé relationships. *Journal of Teacher Education, 35*(3), 21-24.

Glasersfeld, E. V. (1989). Constructivism in education. In T. Husen & T. N. Postlethwaite, (eds.) (1989) *The International Encyclopedia of Education, Supplement Vol. 1*. Oxford/New York: Pergamon Press,162-163.

Glazerman, S., Mayer, D., & Decker, P. (2006). Alternative routes to teaching: The impacts of teach for America on student achievement and other outcomes. *Journal of Policy Analysis and Management, 25*(1), 75-96. doi:10.1002/pam.20157

Goldhaber, D., & Cowan, J. (2014). Excavating the teacher pipeline teacher preparation programs and teacher attrition. *Journal of Teacher Education, 65*(5), 449-462. doi:10.1177/0022487114542516

Goldhaber, D., Liddle, S., & Theobald, R. (2013). The gateway to the profession: Assessing teacher preparation programs based on student achievement. *Economics of Education Review, 34*, 29-44. doi:10.1016/j.econedurev.2013.01.011

Grant, M. M. (2002). Getting a grip on project-based learning: Theory, cases and recommendations. *Meridian: A Middle School Computer Technologies Journal, 5*(1), 83-85. Retrieved from http://www.ncsu.edu/meridian/win2002/514/3.html

Gulamhussein, A. (2013). Teaching the teachers: Effective professional development in an era of high stakes accountability. *Center for Public Education,1*, 1-47. Retrieved from http://conference.ohioschoolboards.org/2017/wp-content/uploads/sites/17/2016/07/1pm111317A114Job-embedPD.pdf

Guskey, T. R. (2002). Professional development and teacher change. *Teachers and Teaching: Theory and Practice, 8*(3), 381-391. doi:10.1080/135406002100000512

Halford, J. M. (1998). Easing the way for new teachers. *Educational Leadership, 55*(5), 33-36. Retrieved from http://www.ascd.org/publications/educational-leadership

Hancock, C. B., & Scherff, L. (2010). Who will stay and who will leave? Predicting secondary English teacher attrition risk. *Journal of Teacher Education, 61*(4), 328-338. doi:10.1177/0022487110372214

Hanushek, E. A., & Pace, R. R. (1995). Who chooses to teach (and why)? *Economics of Education Review, 14*(2), 101-117. Retrieved from conpapers.repec.org

Hanushek, E. (2005). Why quality matters in education. *Finance and Development, 42*(2), l5-19. Retrieved from http://faculty.nps.edu/

Harris, K. R., & Alexander, P. A. (1998). Integrated, constructivist education: Challenge and reality. *Educational Psychology Review, 10*(2), 115-127. doi:10.1023/A:1022169018926

Harris, J. B., & Hofer, M. (2011). Technological Pedagogical Content Knowledge in action: A descriptive study of secondary teachers' curriculum-based, technology-related instructional planning. *Journal of Research on Technology in Education*, *43*, 211-229. doi:10.1080/15391523.2011.10782570

Hebert, E., & Worthy, T. (2001). Does the first year of teaching have to be a bad one? A case study of success. *Teaching and Teacher Education, 17*, 897-911. doi:10.1016/S0742-051X(01)00039-7

Heck, D. J., Banilower, E. R., Weiss, I. R., & Rosenberg, S. L. (2008). Studying the effects of professional development: The case of the NSF's local systemic change through teacher enhancement initiative. *Journal for Research in Mathematics Education*, 39(2)113-152. doi:10.2307/30034894

Heilig, J. V., & Jez, S. J. (2010). Teach For America: A review of the evidence. Retrieved from http://greatlakescenter.org/docs/Policy_Briefs/Heili2 ' TeachForAmerica.pdf

Henry, G. T., Bastian, K. C., & Fortner, C. K. (2011). Stayers and leavers early-career teacher effectiveness and attrition. *Educational Researcher, 40*(6), 271-280. doi:10.3102/0013189X11419042

Hirsh, S. (2009). Before deciding what to do, determine what is necessary. *The Learning Professional*, *30*(1), 71. Retrieved from: https://learningforward.org/the-learning-professional/

Hixon, E., & Buckenmeyer, J. (2009). Revisiting technology integration in schools: Implications for professional development. *Computers in the Schools, 26*(2), 130-146. doi:10.1080/07380560902906070

Hixson, N., Ravitz, J., & Whisman, A. (2012). Extended professional development in project-based learning: Impacts on 21st century teaching and student achievement. *Charleston, WV, West Virginia Department of Education, Division of Teaching and Learning, Office of Research*

Holloway, J. H. (2001). The benefits of mentoring. *Educational Leadership, 58*(8), 85-85. Retrieved from http://www.ascd.org/publications/educational-leadership

Holt, D. G., & Willard-Holt, C. (2000). Let's get real: Students solving authentic corporate problems. *Phi Delta Kappan, 82*(3), 243. Retrieved from kappanmagazine.org

Holt-Reynolds, D. (2000). What does the teacher do?: Constructivist pedagogies and prospective teachers' beliefs about the role of a teacher. *Teaching and Teacher Education, 16*(1), 21-32. doi:10.1016/S0742-051X(99)00032-3

Hudson, P. (2013). Mentoring as professional development: growth for both mentor and mentee. *Professional Development in Education*, *39*(5), 771-783. doi:10.1080/19415257.2012.749415

Hughes, G. D. (2012). Teacher retention: Teacher characteristics, school characteristics, organizational characteristics, and teacher efficacy. *The Journal of Educational Research, 105*(4), 245-255. doi:10.1080/00220671.2011.584922

Hughes, A. L., Matt, J. J., & O'Reilly, F. L. (2015). Principal support is imperative to the retention of teachers in hard-to-staff schools. *Journal of Education and Training Studies, 3*(1), 129-134. doi: 10.11114/jets.v3i1.622

Huling, L., & Resta, V. (2001). Teacher mentoring as professional development. Washington, DC: *ERIC Clearinghouse on Teaching and Teacher Education*. Retrieved from www.ERIC.ed.gov

Hunsaker, L., & Johnson, M. (1992). Teacher under construction: A collaborative case study of teacher change. *American Educational Research Journal*, *29*, 350-372. doi:10.3102/00028312029002350

Ingersoll, R., Merrill, L., & May, H. (2014). *What are the effects of teacher education and preparation on beginning teacher attrition?*. Research Report (#RR-82) Philadelphia: Consortium for Policy Research in Education, University of Pennsylvania. Retrieved from http://repository.upenn.edu/cpre_researchreports/78

Ingersoll, R. M. (2012). Beginning teacher induction: What the data tell us. *Phi Delta Kappan, 93*, 47–51. Retrieved from kappanmagazine.org

Johnson, C. C., Kahle, J. B., & Fargo, J. D. (2007). A study of the effect of sustained, whole-school professional development on student achievement in science. *Journal of Research in Science Teaching, 44*(6), 775-786. doi:10.1002/tea.20149

Johnson, S. M., & Birkeland, S. E. (2003). The schools that teachers choose. *Educational Leadership, 60*(8), 20-24. http://www.ascd.org/publications/educational-leadership

Jonassen, D., Mayes, T., & McAleese, R. (1993). A manifesto for a constructivist approach to uses of technology in higher education. *Designing Environments for Constructive Learning* (pp. 231-247) Springer.

Jones, B. F., Rasmussen, C. M., & Moffitt, M. C. (1997). *Real-life problem solving: A collaborative approach to interdisciplinary learning.* American Psychological Association. doi:10.1037/10266-000

Kaldi, S., Filippatou, D., & Govaris, C. (2011). Project-based learning in primary schools: Effects on pupils' learning and attitudes. *Education 3–13, 39*(1), 35-47. doi:10.1080/03004270903179538

Kelley, L. M. (2004). Why induction matters. *Journal of Teacher Education, 55*, 438-448. doi:10.1177/0022487104269653

Kent, S. I. (2000). Problems of beginning teachers: Comparing graduates of bachelor's and master's level teacher preparation programs. *The Teacher Educator, 35*(4), 83-96. Retrieved from https://tntp.org/publications

Laczko-Kerr, I., & Berliner, D. C. (2002). The effectiveness of "Teach for America" and other under-certified teachers. *Education Policy Analysis Archives, 10*, 37.

Lankford, H., Loeb, S., & Wyckoff, J. (2002). Teacher sorting and the plight of urban schools: A descriptive analysis. *Educational Evaluation and Policy Analysis, 24*(1), 37-62. doi:10.14507/epaa.v10n37.2002

Larmer, J., Ross, D., & Mergendoller, J. (2009).*Project Based Learning (PBL) Starter Kit: To-the-point advice, tools and tips for your first project in middle or high school*. California, USA: Buck Institute for Education.

Lavay, B., Henderson, H., French, R., & Guthrie, S. (2012). Behavior management instructional practices and content of college/university physical education teacher

education (PETE) programs.*Physical Education & Sport Pedagogy*,*17*(2), 195-210. doi:10.1080/17408989.2010.548063

Lebec, M., & Luft, J. (2007). A mixed methods analysis of learning in online teacher professional development: A case report. *Contemporary Issues in Technology and Teacher Education, 7*, 554-574. Retrieved from http://www.citejournal.org

Levin, S. R., Waddoups, G. L., Levin, J., & Buell, J. (2001). Highly interactive and effective online learning environments for teacher professional development. *International Journal of Educational Technology, 2*(2), n2.

Loeb, S., Darling-Hammond, L., & Luczak, J. (2005). How teaching conditions predict teacher turnover in California schools. *Peabody Journal of Education, 80*(3), 44-70. doi:10.1207/s15327930pje8003_4

Loucks-Horsley, S., Hewson, P. W., Love, N. & Stiles, K. E. (1998). *Designing professional development for teachers of science and mathematics*. Thousand Oaks, CA: Corwin Press, Inc.

Loyens, S. M., & Gijbels, D. (2008). Understanding the effects of constructivist learning environments: Introducing a multi-directional approach. *Instructional Science, 36*(5), 351-357. doi:10.1007/s11251-008-9059-4

Lustick, D., & Sykes, G. (2006). National board certification as professional development: What are teachers learning? *Education Policy Analysis Archives, 4*, 5.doi:10.14507/epaa.v14n5.2006

Major, C. H., & Palmer, B. (2001). Assessing the effectiveness of problem-based learning in higher education: Lessons from the literature. *Academic Exchange Quarterly, 5*(1), 4-9. Retrieved from http://rapidintellect.com/

Manuel, J. (2003). 'Such are the ambitions of youth': Exploring issues of retention and attrition of early career teachers in New South Wales.*Asia–Pacific Journal of Teacher Education*, *31*(2), 139–151. doi:10.1080/13598660301611

Marshall, J. C., Smart, J., & Horton, R. M. (2010). The design and validation of EQUIP: An instrument to assess inquiry-based instruction. *International Journal of Science and Mathematics Education, 8*(2), 299-321. doi:10.1007/s10763-009-9174-y

Marshall, J. C., Horton, B., Smart, J., & Llewellyn, D. (2009). *EQUIP: Electronic Quality of Inquiry Protocol*: Retrieved from Clemson University's Inquiry in Motion Institute.

McCaughtry, N., Cothran, D., Kulinna, P. H., Martin, J. J., & Faust, R. (2005). Teachers mentoring teachers: A view over time. *Journal of Teaching in Physical Education*, *24*(4), 326–343. Retrieved from https://journals.humankinetics.com/

McLaughlin, M., & Marsh, D., (1978) Staff development and school change, *Teachers College Record*, *40,* pp. 69-93. Retrieved from https://www.tcrecord.org/

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record, 108*(6), 1017. Retrieved from https://www.tcrecord.org/

National Commission on Teaching and America's Future (2003) *No Dream Denied: A pledge to America's children*. Retieved from http://www.tc.edu/nctaf

Nelson, M. C., Cordray, D. S., Hulleman, C. S., Darrow, C. L., & Sommer, E. C. (2012). A procedure for assessing intervention fidelity in experiments testing educational and behavioral interventions. *The Journal of Behavioral Health Services & Research, 39*(4), 374-396. doi:10.1007/s11414-012-9295-

New American Schools Development Corporation (1997). Working towards excellence: Results form schools implementing New American Schools Designs. New American Schools Development Corporation.

Newcomer, K. E., Hatry, H. P., & Wholey, J. S. (2010). *Handbook of practical program evaluation*. San Fransisco, CA: Jossey-Bass

Newmann, F. M., Smith, B., Allensworth, E., & Bryk, A. S. (2001). *School instructional program coherence: Benefits and challenges. Improving Chicago's schools.* Retrieved from https://consortium.uchicago.edu/sites/default/files/2018-10/p0d02.pdf

Noddings, N. (1990). Chapter 1: Constructivism in mathematics education. *Journal for Research in Mathematics Education. Monograph*, *4*, 7-210.

No Child Left Behind Act of 2001, 20 U.S.C. § 6319 (2008).

Noe, R. A. (1988). An investigation of the determinants of successful assigned mentoring relationships. *Personnel psychology*, *41*(3), 457-479. doi:10.1111/j.1744-6570.1988.tb00638.x

O'Donnell, C. L. (2008). Defining, conceptualizing, and measuring fidelity of implementation and its relationship to outcomes in K–12 curriculum intervention research. *Review of Educational Research, 78*(1), 33-84. doi:10.3102/0034654307313793

O'Connell, D., Hickerson, K., & Pillutla, A. (2011). Organizational visioning: An integrative review. *Group & Organization Management, 36*(1), 103-125. doi:10.1177/1059601110390999

Oliver, R. M., & Reschly, D. J. (2010). Special education teacher preparation in classroom management: Implications for students with emotional and behavioral disorders. *Behavioral Disorders*, *35*(3), 188-199.doi:10.1177/019874291003500301

Opfer, V. D., & Pedder, D. (2011). Conceptualizing teacher professional learning. *Review of Educational Research, 81*, 376-407. doi:10.3102/0034654311413609

Pajares, F. (1996). Self-efficacy beliefs in academic settings. *Review of Educational Research, 66*, 543-578. doi:10.3102/00346543066004543

Piaget, J. (1967). Cognitions and conservations: Two views.

Podgursky, M., Monroe, R., & Watson, D. (2004). The academic quality of public school teachers: An analysis of entry and exit behavior. *Economics of Education Review, 23*, 507-518. doi:10.1016/j.econedurev.2004.01.005

Pogodzinski, B. (2015). Administrative context and novice teacher-mentor interactions. *Journal of Educational Administration*, *53*(1), 40-65. doi:10.1108/JEA-06-2013-0073

Putnam, R. T., & Borko, H. (1997). Teacher learning: Implications of new views of cognition. In Biddle, B. J., Good, T. L., & Goodson, I. F. (Eds.), *International handbook of teachers & teaching* (pp. 1223-1296). Dordrecht:Kluwer.

Raymond, M. E., & Fletcher, S., (2002). "Teach for America." *Education Next 2*(1) pp. 62-68.

Rogers, E. (2003). *Diffusion of innovation*, 5th Edition, New York: The Free Press.

Ronfeldt, M., Loeb, S., & Wyckoff, J. (2013). How teacher turnover harms student achievement. *American Educational Research Journal*, *50*(1), 4-36. doi:10.3102/0002831212463813

Rossi, P. H., Lipsey, M. W., & Freeman, H. E. (2003). *Evaluation: A systematic approach*. Los Angeles, CA: Sage Publications.

Ross, J., & Bruce, C. (2007). Professional development effects on teacher efficacy: Results of randomized field trial. *The Journal of Educational Research*, *101*(1), 50-60.

Ruiz-Gallardo, J., Castaño, S., Gómez-Alday, J. J., & Valdés, A. (2011). Assessing student workload in problem based learning: Relationships among teaching method, student workload and achievement. A case study in natural sciences. *Teaching and Teacher Education, 27*(3), 619-627. doi:10.1016/J.TATE.2010.11.001

Saderholm, J., Ronau, R. N., Rakes, C. R., Bush, S. B., & MohrSchroeder, M. (2017). The critical role of a well-articulated conceptual framework to guide professional

development: An evaluation of a state-wide two-week program for mathematics and science teachers. *Professional Development in Education*, *43*, 789-818. doi:10.1080/19415257.2016.1251485

Saulnier, B., Landry, J., Longenecker, J., & Wagner, T. (2008), From teaching to learning: Learner-centered teaching and assessment in information systems education.*"* *Journal of Information Systems Education, 19*(2), 169-174. Retrieved from http://jise.org/

Scheopner, A. J. (2010). Irreconcilable differences: Teacher attrition in public and catholic schools. *Educational Research Review, 5*(3), 261-277. doi:10.1016/j.edurev.2010.03.001

Serpell, Z., & Bozeman, L. A. (1999). *Beginning teacher induction: A report on beginning teacher effectiveness and retention.*

Shadish, W. R., Cook, T. D., & Campbell, D. T. (2002). *Experimental and quasi-experimental designs for generalized causal inference.* Boston: Houghton, Mifflin and Company.

Skaalvik, E. M., & Skaalvik, S. (2016). Teacher stress and teacher self-efficacy as predictors of engagement, emotional exhaustion, and motivation to leave the teaching profession. *Creative Education*, *7*, 1785-1799. doi:10.4236/ce.2016.713182.

Smith, T. M., & Ingersoll, R. M. (2004). What are the effects of induction and mentoring on beginning teacher turnover? *American Educational Research Journal, 41*, 681-714. doi:10.3102/00028312041003681

Solomon, G. (2003). Project-based learning: A primer. *Technology and Learning-Dayton-, 23*(6), 20-20.

Stevenson, M., Hedberg, J. G., O'Sullivan, K. A., & Howe, C. (2016). Leading learning: The role of school leaders in supporting continuous professional development.

Professional Development in Education, *42*, 818–835. doi:10.1080/19415257.2015.1114507

Stewart, C. (2014). Transforming professional development to professional learning. *Journal of Adult Education*, *43*(1), 28-33. Retrieved from https://www.mpaea.org

Stronge, J. H., Ward, T. J., Tucker, P. D., & Hindman, J. L. (2007). What is the relationship between teacher quality and student achievement? An exploratory study. *Journal of Personnel Evaluation in Education*, *20*(3-4), 165-184. doi:10.1007/s11092-008-9053-z

Stronge, J. H., Ward, T. J., & Grant, L. W. (2011). What makes good teachers good? A cross-case analysis of the connection between teacher effectiveness and student achievement. *Journal of Teacher Education*, *62*(4), 339-355. doi:10.1177/0022487111404241

Thomas, J. W. 2000. A review of research on PBL. http://www. bobpearlman.org/BestPractices/PBL Research.pdf (accessed February 25, 2015).

Thomas, J., Mergendoller, J., & Michaelson, A. (1999). Project based learning for middle school teachers. *Middle School Journal, 36*(2), 28-31.

Timperley, H. (2011). *Realizing the power of professional learning* McGraw-Hill Education (UK).

Tschannen-Moran, M., & Hoy, A. W. (2001). Teacher efficacy: Capturing an elusive construct. *Teaching and Teacher Education, 17*(7), 783-805. doi:10.1016/S0742-051X(01)00036-1

Tynjälä, P. (1999). Towards expert knowledge? A comparison between a constructivist and a traditional learning environment in the university. *International Journal of Educational Research, 31*(5), 357-442. doi: 10.1.1.58.2038

Vagias, W. M. (2006). Likert-type scale response anchors. Clemson, SC: Recreation and Tourism Management, Department of Parks, Clemson International Institute for Tourism & Research Development, Clemson University.

Van Driel, J. H., & Berry, A. (2012). Teacher professional development focusing on pedagogical content knowledge. *Educational researcher*, *41*(1), 26-28. doi:10.3102/0013189X11431010

Velthuis, C., Fisser, P., & Pieters, J. (2014). Teacher training and pre-service primary teachers' self-efficacy for science teaching. *Journal of Science Reacher Education*, *25*, 445-464. doi:10.1007/s10972-013-9363-y

Viel-Ruma, K., Houchins, D., Jolivette, K., & Benson, G. (2010). Efficacy beliefs of special educators: The relationships among collective efficacy, teacher self-efficacy, and job satisfaction. *Teacher Education and Special Education, 33*(3) 225-233. doi:10.1177/0888406409360129

von Glasersfeld, E. (1989). Thirty years constructivism. *Constructivist Foundations 1*(1): 9–12. Retrieved from http://constructivist.info/1/1/009

Vrasidas, C., & Zembylas, M. (2004). Online professional development: Lessons from the field. *Education Training, 46*(6/7), 326-334. doi:10.1108/00400910410555231

Waters, T., Marzano, R. J., & McNulty, B. (2003). Balanced leadership: What 30 years of research tells us about the effect of leadership on student achievement. A working paper.

Wang, H. (2014). Learner autonomy based on constructivism learning theory. *International Journal of Social, Behavioural, Educational, Economic, Business, and Industrial Engineering*, *8*, 1552 -1554.

Watson, G. (2006). Technology professional development: Long-term effects on teacher self-efficacy. *Journal of Technology and Teacher Education, 14*(1), 151. Retrieved from http://www.aace.org

Weiss, E. M. (1999). Perceived workplace conditions and first-year teachers' morale, career choice commitment, and planned retention: A secondary analysis. *Teaching and Teacher Education, 15*, 861-879. doi:10.1016/S0742-051X(99)00040-2

Whitworth, B. A., & Chiu, J. L. (2015). Professional development and teacher change: The missing leadership link. *Journal of Science Teacher Education*, *26*(2), 121-137. doi:10.1007/s10972-014-9411-2

Williams, D. C., Hemstreet, S., Liu, M., & Smith, V. D. (1998). Examining how middle school students use problem-based learning software.

Wilson, S. M., & Berne, J. (1999). Teacher learning and the acquisition of professional knowledge: An examination of research on contemporary professional development. *Review of Research in Education, 24*, 173-209. doi:10.3102/0091732X024001173

Wilson, S. M., Darling-Hammond, L., & Berry, B. (2001). A case of successful teaching policy: Connecticut's long-term efforts to improve teaching and learning. A research report.

Wong, H. K. (2004). Induction programs that keep new teachers teaching and improving. *NASSP Bulletin, 88*(638), 41-58. doi:10.1177/019263650408863804

Yoon, K., Duncan, T., Lee, S. W., Scarloss, B., & Shapley, K. (2007). Reviewing the evidence on how teacher professional development affects student achievement (Issues & Answers Report, REL 2007-No. 033). Washington, DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, Regional Educational Laboratory Southwest.

Retrieved from http://ies.ed.gov/ncee/
edlabs/regions/southwest/pdf/REL_2007033.pdf

Yost, D. S. (2006). Reflection and self-efficacy: Enhancing the retention of qualified teachers from a teacher education perspective. *Teacher Education Quarterly, 33*(4), 59-76.

Appendix A

Email Requesting Professional Development for Teachers

April 12, 2018

Dear Mr. Whitlock,

Thank you again for meeting with me yesterday regarding your leadership abilities, future education plans, and our teacher needs in the Abraham School District. There is great potential for you in our district, and we are fortunate to have you in Abraham Schools. It is not often that someone of your age and experience has the work ethic and desire to work with others. So thank you for reaching out to your principal and me!

I would like to confirm our conversation from April 10, 2018. First, we are certainly interested in you providing professional development for the 2018-2019 school year. As you are aware, we have built days into our school calendar to allow for professional development opportunities for our teachers and principals. I feel that focusing on the development Project Based Learning (PBL) would be an excellent professional development opportunity for our teachers in grades 6-12. These teachers would include core courses as well as technology, agriculture, foreign language, art, music, career, healthcare, etc. It is my opinion that this group of educators has been neglected in our attempts to provide meaningful professional development during the past several years. Although they have received professional development specific to their content, bringing some meaning and consistency to their instruction, while incorporating literacy into the curriculum, can only have a positive impact for students.

Secondly, we would require that you not only provide PBL professional development to this group of about 55 teachers, it would also be necessary to track the implementation of this strategy or strategies in an effort to measure success of the professional development. I would be most interested in knowing this information by the end of February 2019, before we begin planning for the 2019-2020 school year.

In addition to the above, it would also be necessary for you to provide an agenda one week in advance for my approval, select meeting locations, and provide sign-in sheets, which should be forwarded to me after each professional development opportunity. Of course, I would need to be contacted if any problems should occur during any of the sessions. I appreciate your willingness to improve student learning by providing our teachers with this professional development. I am looking forward to the feedback from our teachers regarding this opportunity. If you have questions, please do not hesitate to contact me.

Sincerely,

Lisa Bastings
Chief Academic Officer
Abraham School District

Appendix B

Electronic Quality of Inquiry Protocol (EQUIP)

EQUIP
(Electronic Quality of Inquiry Protocol)

Complete Sections I before and during observation, Sections II and III during the observation, and Sections IV-VII immediately after the observation. If a construct in Sections IV-VI absolutely cannot be coded based on the observation, then it is to be left blank.

Observation date: _____ Time start:_____ Time end: _____ Observer: _____

School: _____ District: _____ Teacher: _____

Course: _____

I. Descriptive Information

A. Teacher Descriptive Information:

1. Teacher gender ___ Male (M), Female (F)
2. Teacher ethnicity ___ Caucasian (C), African-American (A), Latino (L), Other (O)
3. Grade level(s) observed _____4. Subject/Course observed _____
5. Highest degree _____ 6. Number of years experience:_____ 7. Number of years teaching this content _____

B. Student/Class Descriptive Information

1. Number of students in class: _____
2. Gender distribution: ____ Males ____Females
3. Ethnicity distribution _____Caucasian (C) _____ African-American (A) _____ Latino (L) _____Other

C. Lesson Descriptive Information

1. Is the lesson an exemplar that follows the 4E x 2 Instructional Model? (PDI exemplar, non-PDI exemplar, non-exemplar)
2. Working title for lesson:
3. Objectives/Purpose of lesson: Inferred (I), Explicit (E) ___:
4. Standards addressed: State (S), District (D), None Explicit (N) ___ :

II. Time Usage Analysis						
Time	**Activity Codes**	**Organization Codes**	**Student Attention to Lesson Codes**	**Cognitive Codes**	**Inquiry Instruction Component Codes**	**Assessment Codes**
0-5						
5-10						
10-15						
15-20						
20-25						
25-30						
30-35						
35-40						
40-45						
45-50						
50-55						
55-60						
60-65						
65-70						
70-75						
75-80						
80-85						
85-90						

Activity Codes—facilitated by teacher

0. **Non-instructional time**—administrative tasks, handing back/collecting papers, general announcements, time away from instruction
1. **Pre-inquiry**—teacher-centered, passive students, prescriptive, didactic discourse pattern, no inquiry attempted
2. **Developing inquiry**—teacher-centered with some active engagement of students, prescriptive though not entirely, mostly didactic with some open-ended discussions, teacher dominates the explain, teacher seen as both giver of knowledge and as a facilitator, beginning of class warm-ups
3. **Proficient inquiry**—largely student-centered, focus on students as active learners, inquiries are guided and include student input, discourse includes discussions that emphasize process as much as product, teacher facilitates learning and students active in all stages, including the explain phase
4. **Exemplary inquiry**—student-centered, students active in constructing understanding of content, rich teacher-student and student-student dialogue, teacher facilitates learning in effective ways to encourage student learning and conceptual development, assumptions and misconceptions are challenged by students and teacher

Organization Codes—led by teacher

W Whole class
S Small group
I Individual work

Student Attention to Lesson Code—displayed by students

L **Low attention**, 20% or fewer attending to the lesson. Most students are off-task – heads on desks, staring out of the window, chatting with neighbors, etc.
M **Medium attention**, between 20-80% of students are attending to the lesson.
H **High attention**, 80% or more of the students are attending to the lesson. Most students are taking notes or looking at the teacher during lecture, writing on the worksheet, most students are volunteering ideas during a discussion, most students are engaged in small group discussions even without the presence of the teacher.

Cognitive Code—displayed by students

0. Other-e.g. classroom disruption, non-instructional portion of lesson, administrative activity
1. Receipt of knowledge
2. Lower order (recall, remember, understand) and/or activities focused on completion exercises, computation
3. Apply (demonstrate, modify, compare) and/or activities focused on problem solving
4. Analyze/Evaluate (evidence, verify, analyze, justify, interpret)
5. Create (combine, construct, develop, formulate)

Inquiry Instructional Component Code—facilitated by teacher

0. **Non-inquiry**: activities with the purpose of skill automation; rote memorization of facts; drill and practice; checking answers on homework, quizzes, or classwork with little or no explanation
1. **Engage**: typically situated at the beginning of the lesson; assessing student prior knowledge and misconceptions; stimulating student interest
2. **Explore**: students investigate a new idea or concept
3. **Explain**: teacher or students making sense of an idea or concept

Extend: [Extend is important but is not coded as such because it typically is a new Engage, Explore, or Explain]

Assessment Code—facilitated by teacher

0. No assessment observed
1. **Monitoring** (circulating around the room, probing for understanding, checking student progress, commenting as appropriate)
2. **Formative assessment** (assessing student progress, instruction modified to align with student ability) or **Diagnostic assessment** (checking for prior knowledge, misconceptions, abilities)
3. **Summative assessment** (assessing student learning, evaluative and not informing next instructional step)

III. Lesson Descriptive Details		
Time (mins into class)	Classroom Notes of Observation	Comments

IV. Instructional Factors					
Construct Measured		*Pre-Inquiry (Level 1)*	*Developing Inquiry (2)*	*Proficient Inquiry (3)*	*Exemplary Inquiry (4)*
I1.	Instructional Strategies	Teacher predominantly lectured to cover content.	Teacher **frequently lectured** and/or used demonstrations to explain content. Activities were **verification only**.	Teacher **occasionally lectured**, but **students were engaged in activities** that helped develop conceptual understanding.	Teacher occasionally lectured, but students were engaged in investigations that **promoted strong conceptual understanding**.
I2.	Order of Instruction	Teacher explained concepts. Students either did not explore concepts or did so only after explanation.	Teacher asked **students to explore concept before receiving explanation**. Teacher explained.	Teacher asked students to **explore before explanation**. **Teacher and students explained**.	Teacher asked students to explore concept before explanation occurred. Though perhaps prompted by the teacher, **students provided the explanation**.
I3.	Teacher Role	Teacher was center of lesson; rarely acted as facilitator.	**Teacher was center** of lesson; **occasionally** acted as **facilitator**.	Teacher **frequently** acted as facilitator.	Teacher **consistently and effectively** acted as a facilitator.
I4.	Student Role	Students were consistently passive as learners (taking notes, practicing on their own).	**Students were active to a small extent** as learners (highly engaged for very brief moments or to a small extent throughout lesson).	**Students were active as learners** (involved in discussions, investigations, or activities, but not consistently and clearly focused).	Students were **consistently and effectively active as learners** (highly engaged at multiple points during lesson and clearly focused on the task).
I5.	Knowledge Acquisition	Student learning focused solely on mastery of facts, information, and/or rote processes.	Student learning focused on **mastery of facts** and process skills without much focus on understanding of content.	Student learning required **application of concepts** and process skills in new situations.	Student learning required **depth of understanding** to be demonstrated relating to content and process skills.

V. Discourse Factors					
Construct Measured		*Pre-Inquiry (Level 1)*	*Developing Inquiry (2)*	*Proficient Inquiry (3)*	*Exemplary Inquiry (4)*
D1.	Questioning Level	Questioning rarely challenged students above the remembering level.	Questioning rarely challenged students above the **understanding level**.	Questioning challenged students **up to application or analysis levels**.	Questioning challenged students at various levels, **including at the analysis level or higher; level was varied to scaffold learning.**
D2.	Complexity of Questions	Questions focused on one correct answer; typically short answer responses.	Questions focused **mostly on one correct answer;** some open response opportunities.	Questions **challenged students to explain, reason, and/or justify**.	Questions required students to explain, reason, and/or justify. **Students were expected to critique others' responses**.
D3.	Questioning Ecology	Teacher lectured or engaged students in oral questioning that did not lead to discussion.	Teacher occasionally **attempted to engage students in discussions** or investigations but was not successful.	Teacher **successfully engaged students** in open-ended questions, discussions, and/or investigations.	Teacher **consistently and effectively engaged students** in open-ended questions, discussions, investigations, and/or reflections.
D4.	Communication Pattern	Communication was controlled and directed by teacher and followed a didactic pattern.	Communication was **typically controlled and directed by teacher** with occasional input from other students; mostly didactic pattern.	**Communication was often conversational** with some student questions guiding the discussion.	Communication was **consistently conversational with student questions often guiding the discussion**.
D5.	Classroom Interactions	Teacher accepted answers, correcting when necessary, but rarely followed-up with further probing.	Teacher or another student **occasionally followed-up student response** with further low-level probe.	Teacher or another student **often followed-up response** with engaging probe that required student to **justify reasoning or evidence**.	Teacher **consistently and effectively facilitated rich classroom dialogue** where evidence, assumptions, and reasoning were challenged by teacher or other students.

VI. *Assessment Factors*					
Construct Measured		*Pre-Inquiry (Level 1)*	*Developing Inquiry (2)*	*Proficient Inquiry (3)*	*Exemplary Inquiry (4)*
A1.	Prior Knowledge	Teacher did not assess student prior knowledge.	Teacher **assessed student prior knowledge but did not modify instruction** based on this knowledge.	Teacher assessed student prior knowledge and then **partially modified instruction** based on this knowledge.	Teacher assessed student prior knowledge and then **modified instruction** based on this knowledge.
A2.	Conceptual Development	Teacher encouraged learning by memorization and repetition.	Teacher encouraged **product- or answer-focused** learning activities that **lacked critical thinking.**	Teacher encouraged **process-focused** learning activities that **required critical thinking**.	Teacher encouraged process-focused learning activities that involved **critical thinking that connected learning with other concepts**.
A3.	Student Reflection	Teacher did not explicitly encourage students to reflect on their own learning.	Teacher explicitly encouraged students to **reflect** on their learning but only at a minimal **knowledge level**.	Teacher explicitly encouraged students to **reflect** on their learning at an **understanding level**.	Teacher consistently encouraged students to reflect on their learning at multiple times throughout the lesson; **encouraged students to think at higher levels**.
A4.	Assessment Type	Formal and informal assessments measured only factual, discrete knowledge.	Formal and informal assessments **measured mostly factual, discrete knowledge**.	Formal and informal assessments **used both factual, discrete knowledge and authentic measures**.	Formal and informal assessment methods **consistently and effectively used authentic measures**.
A5.	Role of Assessing	Teacher solicited predetermined answers from students requiring little explanation or justification.	Teacher **solicited information from students to assess understanding**.	Teacher solicited explanations from students to **assess understanding and then adjusted instruction accordingly**.	Teacher frequently and effectively assessed student understanding and adjusted instruction accordingly; **challenged evidence and claims made; encouraged curiosity and openness**.

VII. Curriculum Factors					
Construct Measured		*Pre-Inquiry (Level 1)*	*Developing Inquiry (2)*	*Proficient Inquiry (3)*	*Exemplary Inquiry (4)*
C1.	Content Depth	Lesson provided only superficial coverage of content.	Lesson provided **some depth** of content but with **no connections made to the big picture.**	Lesson provided depth of content with **some significant connection** to the big picture.	Lesson provided depth of content with **significant, clear, and explicit connections** made to the big picture.
C2.	Learner Centrality	Lesson did not engage learner in activities or investigations.	Lesson provided **prescribed activities** with anticipated results.	Lesson allowed for **some flexibility during investigation** for student-designed exploration.	Lesson provided **flexibility for students to design and carry out** their own investigations.
C3.	Integration of Content and Investigation	Lesson either content-focused or activity-focused but not both.	Lesson provided poor integration of content with activity or investigation.	Lesson **incorporated student investigation that linked well with content**.	Lesson **seamlessly integrated the content and the student investigation**.
C4.	Organizing & Recording Information	Students organized and recorded information in prescriptive ways.	**Students had only minor input as to how to organize and record information**.	Students regularly organized and recorded information in **non-prescriptive ways**.	Students organized and recorded information in **non-prescriptive** ways that allowed them to **effectively communicate their learning.**

*VIII. Summative Overviews**		*Comprehensive Score***
Summative view of Instruction		
Summative view of Discourse		
Summative view of Assessment		
Summative view of Curriculum		
Overall view of Lesson		

*Provide brief descriptive comments to justify score.

**Score for each component should be an integer from 1-4 that corresponds with the appropriate level of inquiry. Scores should reflect the essence of the lesson relative to that component, so they need not be an exact average of all sub-scores in a category.

Marshall, J. C., Horton, B., Smart, J., & Llewellyn, D. (2008). *EQUIP: Electronic Quality of Inquiry Protocol*: Retrieved from Clemson University's Inquiry in Motion Institute, www.clemson.edu/iim.

Appendix C

Organizational Health Index- Secondary (Revised)

Directions: The following are statements about your school, Please indicate the extent to which each statement characterizes your school from **rarely occurs** to **very frequently occurs.**	**Rarely occurs**	**Sometimes Occurs**	**Often Occurs**	**Very Frequently Occurs**
1. Teachers are protected from unreasonable community and parental demands.	**1**	**2**	**3**	**4**
2. The principal gets what he or she asks from superiors.	**1**	**2**	**3**	**4**
3. The principal is friendly and approachable.	**1**	**2**	**3**	**4**
4. The principal asks that faculty members follow standard rules and regulations.	**1**	**2**	**3**	**4**
5. Extra materials are available if requested.	**1**	**2**	**3**	**4**
6. Teachers do favors or one another.	**1**	**2**	**3**	**4**
7. The students in the school can achieve the goals that have been set for them.	**1**	**2**	**3**	**4**
8. The school is vulnerable to outside pressures.	**1**	**2**	**3**	**4**
9. The principal is able to influence the actions of his or her superiors.	**1**	**2**	**3**	**4**
10. The principal treats all faculty members as his or her equal.	**1**	**2**	**3**	**4**
11. The principal makes his or her attitudes clear to the school.	**1**	**2**	**3**	**4**
12. Teachers are provided with adequate materials for their classrooms.	**1**	**2**	**3**	**4**
13.Teachers in this school like each other.	**1**	**2**	**3**	**4**
14. The school sets high standards for academic performance.	**1**	**2**	**3**	**4**
15. Community demands are accepted even when they are not consistent with the educational program.	**1**	**2**	**3**	**4**
16. The principal is able to work well with the superintendent.	**1**	**2**	**3**	**4**
17. The principal puts suggestions made by the faculty into operation.	**1**	**2**	**3**	**4**
18. The principal lets faculty know what is expected of them.	**1**	**2**	**3**	**4**
19. Teachers receive necessary classroom supplies.	**1**	**2**	**3**	**4**
20. Teachers are indifferent to each other.	**1**	**2**	**3**	**4**

21. Students respect others who get good grades.	**1**	**2**	**3**	**4**
22. Teachers feel pressure from the community.	**1**	**2**	**3**	**4**
23. The principal's recommendations are given serious consideration by his or her supervisors.	**1**	**2**	**3**	**4**
24. The principal is willing to make changes.	**1**	**2**	**3**	**4**
25. The principal maintains definite standards of performance.	**1**	**2**	**3**	**4**
26. Supplementary materials are available for classroom use.	**1**	**2**	**3**	**4**
27. Teachers exhibit friendliness to each other.	**1**	**2**	**3**	**4**
28. Students seek extra work so they can get good grades.	**1**	**2**	**3**	**4**
29. Select citizen groups are influential with the board.	**1**	**2**	**3**	**4**
30. The principal is impeded by the supervisors.	**1**	**2**	**3**	**4**
31. The principal looks out for the personal welfare of the faculty members.	**1**	**2**	**3**	**4**
32. The principal schedules the work to be done.	**1**	**2**	**3**	**4**
33. Teachers have access to needed instructional materials.	**1**	**2**	**3**	**4**
34. Teachers in this school are cool and aloof to one another.	**1**	**2**	**3**	**4**
35. Teachers in this school believe that their students have the ability to achieve academically.	**1**	**2**	**3**	**4**
36. The school is open to the whims of the public.	**1**	**2**	**3**	**4**
37. The morale of the teachers is high.	**1**	**2**	**3**	**4**
38. Academic achievement is recognized and acknowledged by the school.	**1**	**2**	**3**	**4**
39. A few vocal parents can change the school policy.	**1**	**2**	**3**	**4**
40. There is a feeling of trust and confidence among the staff.	**1**	**2**	**3**	**4**
41. Students try hard to improve on previous work.	**1**	**2**	**3**	**4**
42. Teachers accomplish their jobs with enthusiasm.	**1**	**2**	**3**	**4**
43. The learning environment is orderly and serious.	**1**	**2**	**3**	**4**
44. Teachers identify with the school.	**1**	**2**	**3**	**4**

Appendix D

Ohio State Teacher Efficacy Scale (OSTES)

Directions: This questionnaire is designed to help us gain a better understanding of the kinds of things that create difficulties for teachers in their school activities. Please indicate your opinion about each of the statements below. Your answers are confidential.

Teacher Beliefs	**How much can you do?**								
Response Anchors	Nothing		Very Little		Some Influence		Quite A Bit		A Great Deal
1. How much can you do to control disruptive behavior in the classroom?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
2. How much can you do to motivate students who show low interest in schoolwork?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
3. How much can you do to get students to believe they can do well in schoolwork?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
4. How much can you do to help your students' value learning?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
5. To what extent can you craft good questions for your students?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
6. How much can you do to get children to follow classroom rules?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
7. How much can you do to calm a student who is disruptive or noisy?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
8. How well can you establish a classroom management system with each group of students?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
9. How much can you use a variety of assessment strategies?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
10. To what extent can you provide an alternative explanation or example when students are confused?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
11. How much can you assist families in helping their children do well in school?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
12. How well can you implement alternative strategies in your classroom?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)

Appendix E

Mentoring Functions Scale

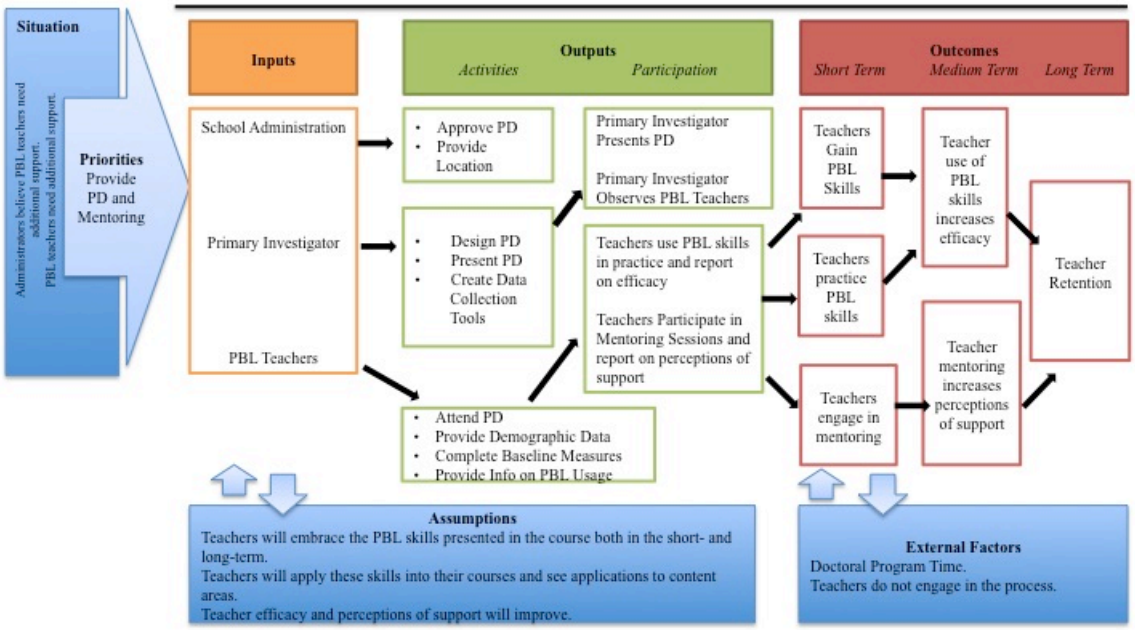
Directions: Concerning the mentoring behaviors below, rate your experience and interactions with your mentor teacher.	To a Very slight extent				To a Very Large Extent
1. My Mentor has shared his/her career history with me.	**1**	**2**	**3**	**4**	**5**
2. My Mentor has encouraged me to prepare for advancement.	**1**	**2**	**3**	**4**	**5**
3. My Mentor has encouraged me to try new ways of behaving in my job.	**1**	**2**	**3**	**4**	**5**
4. I try to imitate the work behavior of my Mentor.	**1**	**2**	**3**	**4**	**5**
5. I agree with my Mentor's attitudes and values regarding education.	**1**	**2**	**3**	**4**	**5**
6. I respect and admire my Mentor.	**1**	**2**	**3**	**4**	**5**
7. I will try to be like my Mentor when I reach a similar position in my career.	**1**	**2**	**3**	**4**	**5**
8. My Mentor has demonstrated good listening skills in our conversations.	**1**	**2**	**3**	**4**	**5**
9. My Mentor has discussed my questions or concerns regarding feelings of competence commitment to advancement relationships with peers and supervisors or work/family conflicts.	**1**	**2**	**3**	**4**	**5**
10. My Mentor has shared personal experiences as an alternative perspective to my problems.	**1**	**2**	**3**	**4**	**5**
11. My Mentor has encouraged me to talk openly about anxiety and fears that detract from my work.	**1**	**2**	**3**	**4**	**5**
12. My mentor has conveyed empathy for the concerns and feelings I have discussed with him/her.	**1**	**2**	**3**	**4**	**5**
13. My Mentor has shared has kept feelings and doubt I shared with him/her in strict confidence.	**1**	**2**	**3**	**4**	**5**
14. My Mentor has conveyed feelings of respect for me as an individual.	**1**	**2**	**3**	**4**	**5**
15. My Mentor helped me finish assignments/tasks or meet deadlines that otherwise would have been difficult to complete.	**1**	**2**	**3**	**4**	**5**
16. My Mentor helped me meet new colleagues.	**1**	**2**	**3**	**4**	**5**
17. My Mentor gave me assignments that presented opportunities to learn new skills.	**1**	**2**	**3**	**4**	**5**
18. My Mentor provided me with support and feedback regarding my performance as an educator.	**1**	**2**	**3**	**4**	**5**

19. My Mentor suggested specific strategies for achieving my career goals.	**1**	**2**	**3**	**4**	**5**
20. My Mentor shared ideas with me.	**1**	**2**	**3**	**4**	**5**
21. My mentor suggested specific strategies for accomplishing work objectives.	**1**	**2**	**3**	**4**	**5**
22. My mentor gave me feedback regarding my performance in my present job.	**1**	**2**	**3**	**4**	**5**
23. My mentor has invited me to join him/her for lunch.	**1**	**2**	**3**	**4**	**5**
24. My mentor has asked me for suggestions concerning problems that she/he has encountered at school.	**1**	**2**	**3**	**4**	**5**
25. My mentor has interacted with me socially outside of work.	**1**	**2**	**3**	**4**	**5**

(Adapted from Mentoring Functions Scale, Noe, 1988)

Appendix F

Intervention Logic Model



Appendix G

Post-Professional Development Feedback Questions

The following are asked in order to elicit feedback for your recent professional development experience. Think about the professional development sessions and activities that you have experienced and respond accordingly. The questions have been adapted from the Post-Professional Development Feedback Survey published by the Missouri Department of Elementary and Secondary Education (2014).

1. What strategies used in the professional development course impact the usage of PBL strategies in classroom instruction?
2. What strategies in the professional development course impact PBL teacher efficacy?
3. What strategies used during the mentoring sessions, as a part of the professional development course, impact PBL teacher perceptions of school environmental support?

Appendix H

Project-Based Learning Teacher Survey Questions

I. Demographic Data

1. What is the highest degree level that you have obtained?
   a. Bachelor's degree
   b. Master's degree
   c. Post-Graduate Degree

2. Describe your entry method into the field of education.
   a. Education/Curriculum Instruction degree
   b. Alternative Certification

3. How many years have you been a teacher?
   a. One year
   b. 2-3 years
   c. 4-5 years
   d. 6+ years

4. How long have you been employed with your current school?
   a. One year
   b. 2-3 years
   c. 4-5 years
   d. 6+ years

5. How did you come to be involved with the PBL setting?
   a. I chose to enter into the PBL setting
   b. My employer required my PBL involvement

6. How many years of experience do you have with Project Based Learning (PBL)?
   a. One year
   b. Two Years
   c. Three Years
   d. Four Years
   e. Five or more years

II-A. Variable- Teacher Preparation

Please select from the following scale the option that best describes your belief about the statement.

(1) Not True; (2) Somewhat True; (3) Generally True; (4) Very True

1. My certification program explored multiple perspectives of learning and classroom instruction.
2. My certification program explored the constructivist model of learning.
3. My certification program explored the PBL modality in depth.

4. My certification program adequately prepared me to be a PBL facilitator.
5. My degree program/certification program adequately prepared me to design and implement rigorous projects in the classroom.
6. Based off of my degree program I feel confident about my ability to implement PBL at a rigorous level.

II-B. Variable- School Environment

Please select from the following scale the option that best describes your belief about the statement.

(1) Not True; (2) Somewhat True; (3) Generally True; (4) Very True

1. My school setting provides multiple avenues for learning such as PBL.
2. My school believes that PBL is a valuable modality of learning.
3. My district and school administrators see the value of PBL
4. My district and school administrators fully support PBL teachers and the implementation of PBL.
5. Other teachers at my school fully support the implementation of PBL.
6. My school provides a support system to help me improve my PBL facilitation.
7. The support system in my school provides opportunities for professional development.
8. The support system in my school provides multiple opportunities for professional learning.

II-C. Variable- Teacher Professional Learning

Please select from the following scale an option that best describes your belief about the statement.

(1) Not True; (2) Somewhat True; (3) Generally True; (4) Very True

1. Professional learning is a priority in my school.
2. My school values the advancement of and the furthering of my education as a teacher.
3. My school provides opportunities for the advancement of my PBL skillset through professional learning.
4. Teachers in my school are consistently involved in developing their PBL skillset.
5. My school requires professional learning to take place during the school year.
6. My school monitors the professional learning requirements of teachers.
7. My school requires me to create a professional development plan including teacher professional learning.
8. The professional learning opportunities that my school has provided are individualized to meet my needs.
9. The professional learning opportunities provided by my school are beneficial to my practice
10. I believe that my practice has improved as a direct result of teacher professional learning.
11. My PBL specific professional learning has prepared me for the implementation of PBL curricula in my classroom.

12. My district/school has ongoing professional learning that helps me improve my PBL facilitation.
13. The professional development at my school/district has helped me become a better PBL facilitator.
14. My school/district provides opportunities to further develop my PBL skills such as teacher certification and or becoming certified as a PBL trainer.
15. I feel supported and encouraged by PBL certified teachers and certified trainers at my school as they help me develop into a better PBL facilitator.

II-D. Variable- Teacher Efficacy

Please select from the following scale an option that best describes your belief about the statement.

(1) Not True; (2) Somewhat True; (3) Generally True; (4) Very True

1. I can successfully implement PBL in my classroom at a rigorous level.
2. My knowledge of PBL has directly influenced my classroom practices at a high level.
3. My PBL implementation is a beneficial practice for my students.
4. My PBL implementation has improved during my time of using the model in my own classroom.
5. I feel that my students will succeed in the future based off of their involvement in PBL.
6. I feel supported by my school administration/coaches in my PBL implementation.

Appendix I

Descriptive Statistics for Efficacy Scores – Teacher Self Efficacy Scale

Teacher Pseudonym	Pre-PD (*n*=55)	Post-PD (*n*=55)
Helen	8.63	8.63
Hank	8.13	8.63
Hannah	8.25	8.25
Jamie	5.10	6.92
Hollie	8.08	8.25
Layla	5.29	6.54
Leah	5.29	6.50
Leslie	5.29	6.30
Hallie	5.38	6.30
Howard	9.00	9.00
Jamy	5.40	6.54
Brooke	6.08	6.49
Amanda	5.88	6.54
Aaron	5.76	6.35
Faith	6.38	6.38
Meredith	6.49	7.02
Kelsey	6.54	7.35
Randall	7.21	7.02
Virginia	7.33	6.54
Andy	7.36	7.44
Zach	7.32	7.45
Lori	7.36	8.00
Elizabeth	5.62	6.52
Lillie	7.65	7.92
Annie	6.55	6.52
Chris	7.32	7.44
Shelby	7.92	7.89
Dolly	8.00	8.00
Lauren	5.94	5.50
Regan	7.44	7.85
Sydney	6.31	6.45
Dana	6.45	7.20
Deana	7.45	7.20
Janet	6.52	7.00
Kim	7.85	8.00
Curtis	7.10	7.42
Stephanie	5.68	6.50
Becky	8.00	8.63
Susan	6.23	7.65
David	5.76	6.45
April	8.00	7.59

Gary	6.25	6.50
Emily	7.95	8.00
Lindsay	5.89	5.75
Jack	7.45	7.50
Joseph	8.00	8.00
Brian	7.45	8.00
Jamie	8.12	8.00
Lydia	6.33	6.50
Walter	8.04	7.67
Loyd	8.08	7.59
Nick	7.13	7.42
Magee	8.03	9.00
Susie	6.52	7.32
Britt	7.04	7.50

Appendix J

Descriptive Statistics for the Organizational Health Index – Organizational Health Index-S

Teacher Pseudonym	Pre-PD (*n*=55)	Post-PD (*n*=55)
Helen	533	558
Hank	545	563
Hannah	584	579
Jamie	585	574
Holli	513	511
Lanie	493	526
Leah	546	513
Leslie	601	605
Hallie	503	561
Howard	560	549
Jamy	574	527
Brooke	587	565
Amanda	507	502
Aaron	544	548
Faith	513	566
Meredith	534	572
Kelsey	520	586
Randall	549	517
Virginia	531	588
Andy	562	545
Zach	570	580
Lori	502	521
Elizabeth	558	552
Lillie	548	558
Annie	478	489
Chris	530	541
Shelby	566	557
Dolly	509	529
Lauren	484	506
Regan	508	581
Sydney	563	522
Dana	539	555
Deana	557	535
Janet	510	507
Kim	516	512
Curtis	491	538
Stephanie	507	526
Becky	532	602
Susan	528	531

David	485	523
April	500	544
Gary	512	555
Emily	511	602
Lindsay	522	608
Jack	523	554
Joseph	582	558
Brian	487	585
Jamie	501	512
Lydia	499	536
Walter	525	559
Lloyd	532	506
Nick	563	524
Magee	563	523
Susie	541	572
Britt	522	594

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SUMMARY:

- Doctoral of Education, Johns Hopkins University, School of Education (Ed.D.) Dissertation focus: Teacher Development/21st Century Learning
- M. A. in Curriculum Instruction
- Licensed by the State of Louisiana, Level 3 license in Secondary Social Studies, Technology Education, and Secondary English
- Master of Arts in Counseling and Guidance from Louisiana Tech

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EDUCATION:

Undergraduate

Louisiana Tech University, B.A. Psychology, February 2007

Graduate School

Louisiana Tech University, M.A. General Counseling, August 2009
Louisiana Tech University, M.A. Curriculum Instruction May 2014
Johns Hopkins University, Doctor of Education, May 2020

EXPERIENCE:

Lincoln Parish Schools, Ruston High School, Director of New Tech Academies (08/17- present)
Director of academies including STEM/Engineering, Health Sciences, and Digital Media. Selection of electives courses for the secondary level, development of curriculum, alignment of curriculum across grade levels, curriculum coaching with teachers, as well as overseeing the financial and budgeting aspects of the program. As a teacher with Lincoln Parish Schools (Ruston High School) current content instruction in Psychology/Sociology through both Project Based Learning and Traditional learning environments.

Louisiana Tech University, Adjunct Professor (08/17 – present)
Responsible for developing course syllabus, monitoring student performance, teaching class materials, instructing students outside of class, and advising undergraduate students. Key competencies in organizational skills, teamwork, communication and intrapersonal abilities, computer competencies, and mentoring.

Louisiana Methodist Children's Home, Family Plus/MST Therapist (1/2010 – 08/2011)
Providing counseling to youth ages 12-18 and their families through using the Multi Systemic Therapy model. Providing services including, career counseling, addiction counseling, and behavioral issues.

The Center for Children and Families, Family Therapist (08/2009- 01/2010)
Providing in-home therapy to parents and teens. Also, providing in school therapy for teens ages 10-18 and group therapy to teens and parents using activities based therapy